RAILROAD GAZETTE

FRIDAY, SEPT. 25.

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Contributions.

The Problem of the Flagman.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A remark credited to the *Industrial World* is that "one of the most useful inventions that can be thought of in connection with operative railroading is one that will automatically take the rear brakeman by the nape of the neck and shoot him back from the train a sufficient distance to protect it when, for any reason, an unusual stop is made."

It appears to me, as I think it must appear to most outsiders, that the above paragraph cites at most but one-half of the requirements of the case. The ejector is all very well, but it is practically useless unless it can be accompanied by a boomerang attachment (a stout rubber cord, operated from the engine and supplanting the time-honored four toots, might answer), which would take the brakeman by the seat of his trousers and jerk him back into the train when it was ready to start.

Without some such device, indeed, it would seem as if the danger inherent in the proposed invention must increase directly with the length of its throw; for with this increases also the length of time during which the train is held unprotected while the brakeman hobbles back to it over the ties.

If the brakeman, after ejection, is to place an explosive track signal, the proposition, as it stands, would cover the case; but when he carries with him (and brings back) only a lamp or flag, the precaution seems to be about as imperfect as could well be imagined; and a piece of artillery which would abruptly land him at a sufficient distance from the train, would be only half effective if it failed to return him to it with equal celerity.

A. B. C.

Two-Cylinder Compound Locomotives.

53 State Street, BOSTON, Mass.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Concerning the communication of "Two Cylinders" in the *Gazette* of Sept. 18, I wish to say that my statement that the point of cut-off in the low pressure cylinder of a quarter crank compound engine is at a point indicated by the reciprocal of the ratio of piston areas is not only a general statement, but it is specifically true in detail. It is well understood by accomplished designers of stationary engines.

The object in view is to have expansion begin in the L. P. cylinder where it leaves off in the H. P. cylinder, thus making the expansion continuous through both cylinders. If the cylinder ratio in any case is 3 to 1, it is evident, since all of the steam in the H. P. cylinder must pass into the L. P. cylinder at each stroke, that the L. P. piston will have swept through a volume equal to the volume swept through by a complete stroke of the H. P. piston when the former has moved one-third of its stroke, and that then the L. P. cylinder will contain steam of a pressure equal to the terminal pressure in the H. P. cylinder.

If this is not clear to "Two Cylinders," he will be convinced if he lays out the theoretical diagrams on the supposition that for a given weight of steam the product of the pressure multiplied by the volume is constant, which is nearly true. He will find that no matter at what point the H. P. valve cuts off, the L. P. cut-off will always be at the same point. It is here assumed that the compression fills the clearances up to the initial pressures. Of course similar remarks will apply to any other cylinder ratio.

F. W. DEAN.

Locomotive Economy.

BUFFALO, September 19, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of this week I note the following: "It is reported that the Old Colony compound engine has shown a saving of 50 per cent. and in some cases 60 per cent. over the simple engines on the Old Colony Railroad. Now while we are enthusiastic regarding the possibilities of the compound system, yet in this instance we feel like asking what is the matter with Mr. Lauder's simple engines?"

From the above it would seem that old Dame Rumor had been getting in some work and her work had been accepted as facts. I have noted with a good deal of interest the progress being made with the compound system of locomotives, which is the first great departure made in locomotive engineering in the past 40 years; unless we can consider that a few types which have lately come before the public are to be so considered; but as these have none of them shown such great improvement over the ordinary locomotives as to create any demand for them, excepting where they are pushed by those who are specially interested in them, it is fair to consider the compound the only departure in principle in that time.

In any of the reports which I have read, I have not seen any data given for comparison, which can convey to the mind of any one not on the spot to see just how the experiments were conducted a full knowledge of what has been done by the "compound."

Experiments of this character are often conducted under—it might be said, are alway conducted under—circumstances very favorable to the device under consideration, as the locomotives are entirely new, with clean boilers, and the best or most careful and intelligent men are selected to run and fire them. They are generally put on special runs, and as a man or agent who is interested in the success of the experiment is usually present with the engine, the engine is not subjected to the losses which come from carelessness, or from other causes which come to engines in the usual or average service of a railroad.

There seem to be but two ways to thoroughly test or compare the compound and ordinary locomotive. First is to build two locomotives exactly alike in regard to boilers, weight and drivers, etc., let the only difference be in those parts incidental to the use of the compound cylinders, get them, if possible, into the same runs, where the daily work will be as nearly alike as possible, put them in charge of the most intelligent men to be found, and then run them for a stated period, say four weeks. Alternating the men in charge, say weekly, so that they will be to some degree in rivalry with each other, so that they shall try in each to excel the records of the others upon each engine, you thus eliminate to a great extent the "personal equation."

If under these circumstances the "compound" shows a gain of 50 per cent. or even 10 per cent. in the fuel used, is as efficient in all places as the "simple engines," there would be a basis for believing that the compound had come to stay.

The records should show, of course, the water evaporation, the amount of fuel used, also the speed of trains, stops, etc.

The second way for a fair trial is to equip a road with such a number of the compounds that they would get the same service as the simple engine through a long period. Then if the compound does as well as the simple engine you will have something to go on.

The "personal equation" is one of the hardest to overcome. It will be noticed that on some roads, in fact all roads, there are usually one or two men who always have the best engines, who always make the best time, who burn the least coal, who use the least oil, and who report the least work to be done on the engines in their charge. These men are usually the ones who are selected to give the test for the new candidate for favor.

I have failed to see a report of where a compound has been put on the "rounds" along with the ordinary locomotive and where the engineer and fireman have been changed every trip, the engine taking her chances with all others. Such a report would be extremely interesting, and I have no doubt would in some cases call for the question, "What is the matter with" the compound, instead of the simple engine?

This is not to be considered a criticism of the compound system, only an appeal for new light, and a dislike for the voice of Dame Rumor. I have seen cases where the reports showed for a given time that one ordinary engine had a saving of 50 per cent. and even more over another ordinary engine in the same service, and in these cases it was evident there was something the matter with the engines or the report. In this case it is probably with the report, as Mr. Lauder is noted as a very thorough and efficient mechanical engineer.

F. M. WILDER.

Analysis of the Trials of the Johnstone Compound.

LA PAZ, Aug. 15, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

From the results of a number of comparative tests of a Johnstone compound locomotive on the Mexican Central Railway, published in the *Railroad Gazette* of May 22, 1891, some important facts can be deduced in regard to the performance of locomotive engines well worthy to be taken into consideration by engineers projecting railroad lines in Mexico.

Although the tests are very clearly explained, and the results presented in a thoroughly comprehensive and systematic manner, yet, for sake of completeness, it would have been desirable to know the exact value of a "unit of work." Mr. Johnstone says: "One hundred gross tons hauled one mile at a very low speed, over a straight and level track, was taken as a unit of work. The profile of the road was carefully studied, and the line reduced to an equivalent of a straight and level track (curves, being compensated, were left out of the calculation.)"

On the section from S. Juan del Rio to Cazadero, 18.3 miles, curves predominate very largely, the compensation or reduction of grade being 0.03 per degree, which seems to be ample, as found by experience in operating the line.

In Tables Nos. 5, 6 and 7, containing the results of runs on continuous 1.5 per cent. grade between S. Juan del Rio and Cazadero, we find the time expended on the trip; taking engine No. 66:

1.	Nov. 15, 1890,	2 h.	20	min.	}
2.	" 25, "	2 "	15	"	
3.	Jan. 17, 1891,	2 "	20	"	
4.	" 20, "	2 "	20	"	} average 2 h. 20 min.
5.	" 11, "	2 "	30	"	
6.	" 15, "	2 "	15	"	

The distance being 18.3 miles we obtain the average speed at 7.844 miles per hour. The average gross train load, including engine and tender, was 494 tons; the gross weight of engine and tender being 90 tons. See Table No. 1.

If we use Searles' formula we obtain for average resistance of entire train in pounds per net ton for all weights in net tons:

$$R = 4.82 + .005357 \times 7.844^2 + \frac{.0004783 \times 7.844^2 \times 90^2}{494}$$
$$= 5.632 \text{ lbs.}$$

This resistance expressed in the form of a coefficient, per ton of 2,000 lbs. is 0.00282; we may use 0.003 in our future calculations without committing an error of consequence and will call this coefficient r, thus:

$$r = .003 \qquad \text{(Equation 1.)}$$

The resistance of a 1.5 per cent. grade is:

rate of grade in per cent. × 20 = 30 lbs. per ton,

which, expressed in the form of a coefficient, per ton of 2,000 lbs. is 0.015. Calling this coefficient g, we have

$$g = .015 \qquad \text{(Equation 2.)}$$

Let us call the total weight of train, including engine and tender, T; then the total resistance overcome by the engine is:

$(r + g) \times T$ = tractive force developed. (Equation 3.)

Introducing the corresponding values, we have

(.003 + .015) × 494 = 8.892 tons = 17,784 lbs.

at 7.844 miles per hour, on a 1.5 per cent. grade. The distance between S. Juan del Rio and Cazadero being 18.3 miles, the average tractive force developed in ton miles is 8.892 tons × 18.3 miles = 162,723 ton miles, or 325,446 lbs. From Tables Nos. 5, 6 and 7 we obtain the average total "units of work" performed as 498.83; then we have for a unit of work:

$$\frac{325,446}{498.83} = 652.42 \text{ lbs.}$$

Probably Mr. Johnstone estimates the value of a "unit of work" at 650 lbs., which is equivalent to a resistance of 6.5 lbs. per ton, for

100 tons × 6.5 lbs. × one mile = 650 lbs.

Now, returning to the average tractive force developed by engine No. 66, on the six experimental runs, we note at once the very important fact, that the rate of adhesion obtained was rather low, while the average speed was only 7.844 miles.

The weight on drivers being 100,000 lbs. and the average tractive force developed 17,784 lbs., the rate of adhesion was only 0 18 or 18 per cent., less than ⅕ or 20 per cent., the lowest average rate generally assumed for American locomotives.

The climatic conditions throughout the region traversed by the Mexican Central, in fact of the entire central part of Mexico, are the most favorable, and especially during the season in which the experiments were carried on. The rail in use on the line is 56 lbs. per yard, and the track on this section always in a very fair condition.

If we analyze the performance of engine No. 107, we arrive at the following average results:

Average speed, 8.73 miles per hour.

Average gross train load, including engine and tender, 456.33 tons.

Average traction force developed

(.003 + .015) × 456.33 = 8.214 tons = 16.423 lbs.

Tractive force in ton-miles,

8.214 × 18.3 = 150.316 ton-miles or 300,632 lbs.

Average units of work performed, 460.833.

Value of a unit of work:

$$\frac{300,632}{460.833} = 652.37 \text{ lbs.}$$

practically identical with the value derived from performance of engine No. 66.

Referring to Tables 2, 3 and 4, we find the average coal consumption to be, on the through runs to Mexico, 118.4 miles: Eng. No. 66, 12,059 lbs; Eng. No. 107, 13,583 lbs.

The average number of units of work performed on these runs is:

Eng. No. 66	1,613
Eng. No. 107	1,453

To obtain the tractive force developed, we have to multiply the above figures by the value of a unit, thus:

$$\text{Eng. 66, } \frac{1613 \times 652.4}{2000} = 526.16 \text{ ton-miles.}$$

$$\text{Eng. 107, } \frac{1453 \times 652.4}{2000} = 473.968 \text{ ton-miles.}$$

Dividing the average coal consumption by these values, we have for the average number of lbs. of coal consumed per ton-mile of tractive force, then, for

$$\text{Eng. 66, } \frac{12{,}050}{526.16} = 22.901 \text{ lbs.}$$

and

$$\text{Eng. 107, } \frac{13{,}583}{473.968} = 28.658 \text{ lbs.}$$

On the runs between San Juan del Rio and Cazadero, 18.3 miles, the average coal consumption was:

Eng. 66..... 3,675 lbs.
Eng. 107..... 4,300 lbs.

Dividing again by the average tractive force developed, we have average number of pounds of coal per tractive force:

$$\text{Eng. 66, } \frac{3675}{162.723} = 22.58 \text{ lbs.}$$

and

$$\text{Eng. 107, } \frac{4300}{150.316} = 28.60 \text{ lbs.}$$

We may draw now the following averages, *per ton mile of tractive force:*

For Eng. 66, compound.....22.75 lbs. of coal consumed.
For Eng. 107, simple.....28.625 lbs. of coal consumed.

Taking the cost of coal at $11 per ton, *the cost of one ton of tractive force developed by the engine, per mile (ton-mile), for fuel alone is*

12.5 *cents for the compound engine,*
and 15.75 *cents for the simple engine;*

the compound engine causing an economy of 26 *per cent in cost of fuel.* A. R.

Car Lubrication.

ALTOONA, Pa., Sept. 11, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reviewing "Car Lubrication" in your issue of Sept. 4, 1891, you have made indiscriminate extracts of specific applications and discussed them as general ones, as well as misquoted the text and treated the errors in the quotation as errors in the book.

To say that it is speculation to state that the laws governing the friction of solids separated by a lubricant are more nearly allied to the friction of fluids than of solids is surprising. It is hoped you do not intend to impress your readers that the friction of solids as determined by Morin are still intact and applicable to the case where a lubricant is used. It is difficult to see how anyone could adhere to such an opinion with the experiments of Woodbury and Tower and tests which are made every day where the Thurston machine is in practical operation. Practical experience in the various kinds of car service is even more convincing.

The reference to page 24 is extremely partial. The example of the comparison of the sperm and mineral oils is given simply as an illustration of the statement immediately preceding it, but not as the maximum pressure which these oils are capable of sustaining under different conditions. It is quite well known that oils are capable of sustaining for a limited time, such as when a new bearing is placed on an old journal, or where the two are of different radii, and also in crank pin service, the pressure specified by you, but if you will quote any figures giving a comparison of the *relative* resisting powers of different oils under the *same conditions*, I, for one, shall be very glad to see them. I could find no such figures, nor would they prove of any more value as illustrating the *relationship* between the *resisting* power and surface in contact. They would simply represent the relative behavior of the oils under the extreme pressure. The seizing pressure as given for the two oils was not accidental, as you state, but were the resisting pressures under the *same conditions* of the apparatus, including temperature, condition of bearing surface and method of feeding the oil. To say that the example was given as a "generalization" of the value and application of the two oils is misleading and an incorrect conclusion from the text, as the words immediately following this example are: "This conclusion has, of course, its practical limits as well as modifications by results of the resistance value of oils from more thorough experimental results."

If you had read page 21 carefully you would have found stated as a precaution just about what you have used as part of your criticism. It is where the application of laboratory tests to practical service are discussed and reads as follows:

"The conditions here met are not, however, such as will allow the delicately calculated conditions of a constant relationship of bearing surface, lubrication, temperature and pressure, *but require a large factor of safety to be used to cover the variation which takes place in the service.* For instance, when starting with a new bearing, the surface in contact is much less than when it has worn down to a point where the whole arc of contact has been obtained," etc.

You then turn upon yourself and correct the practical figure which is given for the thickness of the film of oil, and ask that one obtained in the laboratory, under the very best conditions and such that are never met in practice, be substituted for it.

At this point we run across a term which is unique, for I must confess I have never seen a bearing in railroad service which had obtained a "high polish *automatically.*" I presume you mean by this a bearing which had been worn smooth by service. The statement, as a whole, could not have received second thought, for bearings in car service never reach a "high polish," and only a fair polish after they have worn down to the condition where the bearing is in contact with the journal throughout the whole of its arc. When worn to this condition you will remember that the bearing surface is materially increased, resulting in a decrease of pressure carried per square inch. The bearing is then also worn to the alignment of the box, and, therefore, in the best condition to resist heating and abrasion.

In the discussion of the formula for horse-power I am really at a loss to see how such a gross error in quoting could be made. You give the value of the function J= *pounds* resistance at *drawbar* per ton due journal friction. It is distinctly given in "Car Lubrication" as follows (to quote from page 53): J= journal resistance in pounds per ton of load. The necessity of the ratio of the journal and wheel diameters to obtain the pounds at the drawbar will be evident at once. The formula given for the horse power is discussed on page 54, which if you had read you would have found the time given as "at a constant speed of 15 miles per hour."

I am pleased to learn the book is a disappointment to your reviewer. I was loath to undertake to compile and discuss a mass of figures and tests which have now become obsolete. The attempt was to include only that which is applicable to the present condition of the subject, and to the exclusion of all that would tend to confuse it. From the fact that it is a disappointment to your reviewer I hope we may look for an *exhaustive* treatment of the subject from him or some one else which will bring about the result for which "Car Lubrication" was written. W. E. HALL.

[While the above letter explains what Mr. Hall probably intended to have his readers gather from his text, it does not alter the text. The only *definite* application of the ideas or facts, resulting from laboratory experiments, discussed by the author up to page 24, is that cited by us, and referred to as a "generalization." If the term "demonstration" or "illustration" is more to the author's taste we agree to it, and still make the criticism that no such deductions as made are warranted by any data from Tower's experiments.

The paragraph "The condition here met, etc.," from page 21, coming before the author commits himself to his numerical figures, does not save the inexperienced reader from confiding himself to the latter, as no *definite* reservation is made at page 24 regarding the impracticability of the conclusions. We do not repudiate any of the facts of either Tower's or Woodbury's experiments, but we question Mr. Hall's interpretation of their significance. If measurements of the thickness of lubricating films have been made showing a depth of one-twentieth of an inch, we shall be glad to know the details and place them fairly before our readers.

We think that railroad brasses, which have run without overheating, acquire a surface which, relatively to bearings in all other classes of service at least, may be very properly described as "highly polished." Our criticism loses no force, however, if we accept the author's statement that what we mean is a bearing "worn smooth" in car service.

Regarding the formula for horse power, we diligently studied page 54, but since the author's figure, on this page, for horse power "1.82" fits the formula page 53, *without any use of the fifteen-mile speed as a time factor*, his explanation does not impress us as covering our point. Also if, on page 54, *J* is resistance at a 4-in. journal on a 33-in. wheel, and has a value of three pounds, why is it that at page 21 the term "journal resistance" is used to represent what is equivalent to three pounds multiplied by the ratio of journal to wheel diameter? The formula for horse power is certainly given (page 53) as a general one, with no mention of time. If we use a speed of 15 miles, the horse power, for the conditions on page 54, is about 0.23 per journal, or one-seventh of the author's figure, taking *J* as drawbar resistance. If *J* is taken as journal resistance, the horse power is only about one-eighth of this amount.—EDITOR RAILROAD GAZETTE.]

The M. C. B. Coupler Gauges.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As a subscriber to your journal, and a close observer of all the movements and work done in the solution of the M. C. B. coupler question, allow me to say a few words concerning the committee's work on the new gauges for governing the construction of the vertical plane couplers in the future.

In reference to your comments and criticism in the *Gazette* of Sept. 18, page 652, on the new gauges, I desire to say, as a coupler inventor, that the work of the committee stands high above all criticism that may be offered by the railroad journals or coupler builders for several reasons. First, because the variations are correct; if placed entirely within the line upon the guard arm side, as referred to in your article, there would be castings where the shrinkage would be such as to condemn them, when, so far as service is concerned, there would never be any difficulty.

Second. The composite gauge is the only means by which the work can be done.

Third. Any coupler manufacturer that cannot operate with the limit of the gauge and put a first-class coupler on the market at the price asked for them, should be drummed out of the market and not permitted to continue the imposition of placing their inferior production upon the railroad systems of this country at the expense of railroad companies and to the danger of the general public. The prices asked for couplers are sufficient to warrant first class machine fit couplers, and chose who object are certainly not considering other than their own precious pockets at the expense of those they deal with therefore, the work of the committee done upon the gauge as presented in your journal is with high honor and credit, tempered with justice, for all concerned.

JUSTICE.

[This letter is from a coupler maker whose product is well and widely known, and we have no doubt that the committee will be glad to have his public approval.—EDITOR RAILROAD GAZETTE.]

Grovetown Station.

The design of the Grovetown station building on the line of the Georgia Railroad Co., a few miles beyond the city of Augusta, has been prepared to meet the requirements of southern railroad traffic, and to provide a model building of its kind. For a town of several thousand people, and somewhat of a suburban station as well, the requirements in the South are for a building with accommodation for first-class passengers (white), and second class passengers (negroes), both under the general supervision of the station agent, who is telegraph operator and ticket agent as well. It is also necessary to provide a freight room and large platform for handling cotton and merchandise. The Grovetown station combines all these special features in a simple, picturesque and quaint building—one which helps the town, and that advertises and builds up the railroad as well.

The windmill (forming so picturesque a feature of the building) was designed with special reference to the necessary water supply in connection with the toilet accommodations, etc., of the building, as a practical and simple solution of this problem.

If railroad officers gave the subject more thought and study, they would realize the fact that it is really cheaper in the beginning as well as the end to have some competent architect design and plan these stations. Everywhere, handsome and appropriate, they are a source of local pride, as well as of increased business and traffic to the railroad. The thousands of smaller stations throughout this country, generally absolutely void of any beauty of outline, or convenient arrangement of space and design, demonstrate more forcibly than any argument, the force of the above statement.

The material used at Grovetown for the exterior of the building has been cypress shingles (stained with creosote) on the sides, which, with metallic shingles on the roofs, form a durable and serviceable covering at minimum cost.

The general ground plan is arranged in such a manner as to afford the greatest convenience to the public and economical service to the railroad company. This is but one of the picturesque stations now in course of erection on this line, costing about $5,000.

The street end of the building is occupied by the first-class passenger waiting room, 24 × 24 ft. in size, with a large alcove in the turret for ladies, and also ample toilet accommodations. The ticket and telegraph office is on the track side, 9 × 15 ft., and, by means of a projecting bay window, commands a view up and down the tracks. The second-class waiting room, 14 × 24 ft., and toilet accommodations, are located adjoining, with ticket windows opening into each waiting room. Beyond this the space is occupied by the freight building, 32 × 24 ft., and platform 10 ft. on the sides and 20 ft. on the end also, for whatever baggage and express business it may be necessary to handle. The platform extends around the building 10 ft. in width, covered by the projecting awning, and the porte cochère is provided for the convenience of those who drive to the station.

Indian Railroad Notes.

CALCUTTA, July 18, 1891.

This has been an exceptional season altogether. During April and May, when we are supposed to have dry, hot weather, there were heavy thunder storms every few days, and the temperature was much lower than usual; but in June, when the regular monsoon *should* have commenced, the sky was cloudless and the heat something to remember. Horses fell down dead while at work, and cases of sunstroke and heat apoplexy —many of them proving fatal—were reported every day.

For a time it appeared probable that business would have to be entirely suspended, for no one cared about exposing himself to the rays of the sun between 9 A. M. and 4 P. M., and the law courts only worked during the early morning hours and late in the evening. Fortunately the monsoon burst on June 27, and since that date we have had plenty of rain. The Northwest Provinces, Madras and part of the Punjaubs, have had no rain worth mentioning up to date, and cattle are dying by the hundreds for want of fodder and water. Traveling from Scinde to Bengal, the railroad passes through the Punjaub and the Northwestern Provinces, and by July 1 the fields are generally green; but this season the country looks like a desert until the boundary line dividing Bengal from the upper provinces is passed. Not a blade of grass can be seen, and in many places the wells and water tanks are dry. Cultivators are all behind with their work, and famine reliefs works will be necessary ere long in parts of the country where the most distress exists.

So far as can be judged at present the wheat crop will be much below the average, and this will seriously affect the earnings of all railroads, as well as the shipping companies. The brisk export trade which commenced last April has benefited all the principal railroads, and the shareholders will fare much better than they did last year.

Major Gardiner, of the Royal Engineers, was appointed Agent, in India, of the East Indian Railway, a few days after my last letter was dispatched. He was formerly Deputy Manager of the Rajputana Railway, and for some years past has been Manager of the Bhovnagar Gondal, State Railway.

The results recorded at the half yearly meeting of the E. I. R. Board of Directors (held in London on July 1) are very good, and the dividend of 7s. 6d. per cent. (in addition to the guaranteed interest) expected, was increased to 8s. 6d. The working expenses were only 27¾ per cent. of the gross receipts, a result which speaks well for all concerned in the management.

The government report on the wheat crop of 1890-91 shows that the total yield was 689,900 tons more than in the previous year, but then 1889-90 was one of the worst years we have had for a long time. Protectionists and other faddists have been trying hard to have an export duty placed on wheat on the plea that this would prevent the prices being raised to such a point that the poorer classes cannot afford to purchase it. Some have gone so far as to say that the heavy exports of the last few months will cause a famine, and that ere the next crop is due we shall have to import wheat. This is not likely to occur, as all classes of natives prefer rice to any other grain. The fact of the matter is, that most of the wheat grown is intended for export, and if the demand ceased, or the prices in Europe were not sufficiently high to tempt shippers, the land which now carries wheat crops would either lie idle or be used for other purposes.

The great Indian Peninsular Railway has profited most by the boom in wheat. During the month of April the gross receipts were Rs.1,200,000 *more* than during the corresponding period of last year, and as the rush continued during the whole of May and June, during which period every available wagon was kept fully employed, spare third-class carriages and horse boxes were also utilized; the shareholders are looking forward to a bumper dividend. The Oude & Rohilkund Railway has also done well, and the Indian Midland shows a marked improvement. The Bombay, Baroda & Central Indian Railway has not participated in the general success, and during April showed a falling off.

The Bengal Iron & Steel Co. has a large order for D. & O. cast iron plates, and jaws, from the Eastern Bengal State Railway, and when they are in a position to undertake a larger order, it will no doubt be forthcoming. The tiebars and keys for these plates will, it is said, be manufactured from scrap rails and fish plates, at the E. I. R. Inmalpur works, also reduces the amount of European indents, and, consequently, the loss on exchange.

Punkah pulling by machinery is a question which crops up every few years and just now it is very much to the front. Messrs. Jessop & Co. fitted up one of the barracks in Fort William with Watson's patent pneumatic punkah machines in May last, and it has since been working to the satisfaction of all concerned. Each machine can pull a train of 36 punkahs with a swing of 6 ft., and there is no noise. Several electric punkahs, or fans, have also been invented, but in spite of all this the punkah coolie will not lack employment for many years to come.

A new method of cooling railroad carriages is being tried on the C. I. R. It is intended for the use of invalids and others who are willing to pay high rates, but will be too expensive for ordinary use. A carriage fitted up in this way was tried between Howrah and Allahabad last month, and when the temperature on the platform—in the shade—was 112 degrees, the thermometer in the carriage only registered 83 degrees Fah. The sides, roof and floor of the carriage are double, leaving a space which is filled with sawdust. The windows, with the exception of two, which are fitted with double glasses, are so fitted that not a breath of the hot air can enter. Blocks of ice, measuring 14 in. × 12 in., are placed in a cupboard in the lavatory compartment, supported on zinc trays, and from the top of the cupboard a pipe leads to an inlet cowl in the roof, and the cooled air is dispersed through perforations. An exhaust cowl is fitted at the opposite end of the carriage, and thus a continual current of air is kept up. The cost per hour is one rupee for each carriage, and the air is dry as well as cold.

Mr. George Payne, of the Indian Midland Railway, has also invented an apparatus, which is fitted under the bottom of the carriage and is so arranged that it catches the air from all directions, and provides a cool and pleasant breeze while the train is running. It is self-revolving and works for 15 minutes after the train is at rest.

The East Coast Railway is progressing slowly. One engineer has died of malarial fever and four others are on the sick list. A feeder line from the main line near Ganjam to Goonipore is being surveyed and it is proposed to construct it on the 2-ft. 6-in. gauge; another mistake. It is now estimated that the cost of the main line will be Rs.90,000 per mile.

On June 26 the first vessel entered the new Kidderpore docks. The operation of bringing it from the river and securing it in the graving dock occupied a few minutes over one hour. A few days after this one of the large hopper barges listed to one side while carrying a cargo of dredged mud, and sank in 12 feet of water. It is by no means certain that the docks will benefit the Calcutta traders to such an extent as was anticipated when the work was first projected. Already a scheme is on foot for dredging the Mutlah River, and providing increased railroad facilities between Calcutta and Port Canning, and if this is carried out very little work will be done at the docks.

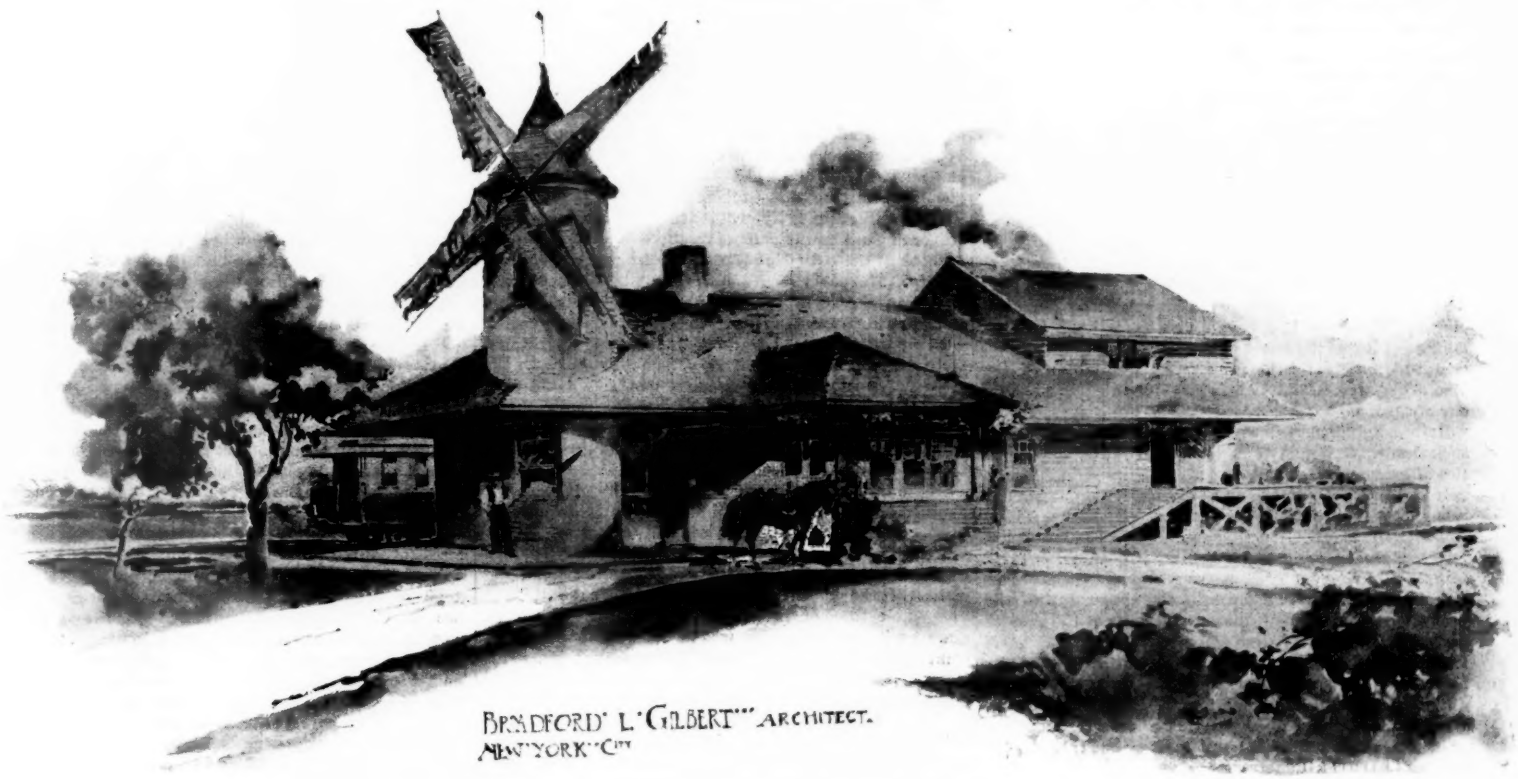
Sir Lepel Griffin's Kashmir railroad scheme has not been favorably received by government, who think that the guarantee asked for (4½ per cent.) is too high. The capital for the Bengal Dooars Railway—£140,000—has all been subscribed in London, and the work will be commenced next cold season. The Sambalpore branch of the Bengal Nagpur Railroad has been sanctioned by the Secretary of State for India, and the Government of Bengal have sanctioned the construction of a branch line from Barsol to Kissengunge (E. B. S. Railway). The first sod of the "Nilgiri" (Mountain) Railway will be cut on the 3d August, and in less than two years those who wish to visit the charming sanitarium of Coonoor will be able to travel the whole distance by rail. Our other mountain railroad from Kalka to Smila appears to hang fire, but unless the Viceroy chooses some other summer residence, it is bound to be constructed before long.

There have been several serious accidents during the last three months. A tornado at Sara Ghaut station overturned a train of 36 empty carriages which were in readiness to convey the mails and passengers from Calcutta to Darjeeling; the locomotive sheds were also wrecked, and the roofs of two ferry steamers blown away bodily. The iron roof of the station was rolled up like so much paper, and over 200 dwelling-houses were razed to the ground. Fortunately, no lives were lost.

It is said that certain manufacturers in Germany have for some time past been in the habit of putting inferior rails, axles, wheels, etc., with those of the quality ordered. This has enabled them to undersell honest manufacturers and probably accounts for the many cases of broken axles on certain railroads where cheap material is held in favor.

The specimens submitted to the test were of course up to the required standard, but even when the supplier is perfectly honest, two pairs of axles made of the same material sometimes give very different results, and owing to this steel axles are not popular in India at present.

NUT LOCK.



GROVETOWN STATION—GEORGIA RAILROAD COMPANY.

Railroading in Spain—Notes by a Mechanic.

When railroads were first introduced into Spain, and for some years after, Englishmen were plentiful on the Iberian roads, from under directors to drivers. Many of the latter came out with the numerous locomotives sent over from England, to get the natives into the habit of properly handling them, and show them how not to burn them out. In those days the Britishers could return home and narrate many an account of their experiences and the state of railroad affairs on the peninsula. Doubtless some of their recitals of engineering life in Spain, during the fifties and early sixties,

found their way into print, although the writer has never seen or read any such.

Spain was and is a bad place for English mechanics. In the land of pure rough wine at twopence per liter, they were no use. Their arrival was synonymous with getting drunk. Some braved the temptation for a few months out of respect for their new positions, then broke down, and had to be sent home to the country where beer was higher priced than wine in Spain.

Nowadays an Englishman is a rarity on an Iberian *ferrocarril*. Natives have everywhere supplanted them. The only remaining English traces are the locomotives (British engines being in the majority) and many of the old-fashioned coaches. A generation has passed since the unmusical English language was last generally heard on the peninsular roads.

During my journey over the Spanish roads I have stopped to look in at the principal workshops. The largest are believed to be those at Valladolid (a town of over 60,000 population, where Columbus died in 1506). These shops pertain to what is now considered, with its recent amalgamations, to be the chief railroad of the peninsula—Compañía de los Caminos de Hierro del Norte de España. There is a total of 2,000 kilometers, say 1,250 miles, under actual exploitation. But, unfortunately, data are not at hand of the Valladolid sheds.

Locomotive cosmopolitanism is a feature on Spanish roads. In the sheds of the Norte, near the Catalan capital (directed by R. Torres), employing 300 men, five different types of locomotives were remarked among 22 at the moment under hospital treatment. The name plates show that they hail from as diverse localities—Britain, France, Belgium, Germany, Austria and Switzerland, and perhaps Italy, not forgetting some built in Spain itself. A few of the makers' names were noted: Schneider & Co., Creusot, year 1877; Sharp & Stewart, Manchester, '81; Graffenstaden, Bas'-Rhin, year '64; Hannoversche Maschinenbau, Linden, '82. One locomotive was shown, constructed by Beyer & Peacock, Manchester, '62, which had been blown to pieces; what remained of it was the worst wreck ever seen. Fortunately, or unfortunately, for the fireman, he was blown to —— also. They were standing at a station, he being the only one aboard.

Railroad engineers in Spain thus become, by their association with so many and varied types and nationalities of locomotives, much experienced in different systems, and can pronounce an authoritative opinion as to which country's outputs are the best. Of course, they consider the English machines as holding the first rank.

According to one memorandum, a leading Spanish company having 524 locomotives will have, on an average, over 100 of these come into the shops during the year for repairs. Faulty tubes are the evils of the greater part, and about a fourth require new furnaces. A working engineer of much experience gave it out as his opinion that the life of a locomotive on the undulating roads of mountainous Spain was 25 years, during which time it would do some 4,000 kilometres monthly, or in the course of its life (discounting time taken up by repairs) 1,000,000 kilometres.

The carriages have an average total width of 3.35 meters, and come either from Britain or the Société Industrielle Suisse, of Neuhausen (since 1882), or are almost, by repeated renovations, of rough native make. As a favorer of home industries for each particular state the writer would be glad to see and record native-built coaches, trucks and machines for Spain. This will assuredly come about in the course of years, although, as the Spaniards are not over-quick in business enterprise, it will take a long time. Much of the machinery in the repairing sheds is English.

Salary figures are always of interest. Drivers are paid from 300 to 350 pesetas (60 to 70 duros or dollars) per month, or at least they are able to make between these sums. This includes the pro rata amount for the economy they can realize on coal. For Spain, £12 to £14 monthly is quite a decent amount. But it seems that land engineers, like Spanish marine *ingenieros*, are pretty well paid. Firemen fall behind considerably in their remuneration, only from 1,250 to 1,500 pesetas yearly, or between 100 and 130 francs per calendar month. This is from $20 to $26 (the Spanish duro is nearly the value of an American dollar, and the same sign is now employed for brevity before Iberian figures). True, the fireman adds by means of premiums to the alleged extent of nigh half his regular wages in the course of the year, but these extras are rather uncertain.

Mechanics employed in the railroad sheds work 10 hours daily, and receive on an average 3½ pesetas per diem. Some get only 2¼, while others are paid six. It is only the skilled labor which is so magnificently rewarded with $7 per week. It is a wonder these latter practical mendo notgo to the United States where they would obtain honest remuneration for their ability, and where they could live, if they chose to continue to live poorly, at the merest trifle in excess of what they are paying in worn-out old Spain. But, the fact is, once there, and having the money, mechanics and artisans will not live either poorly or cheaply. They live far better than in Europe, and, of course, pay higher prices. It thus comes about that among workmen on the Continent, with whom the writer has repeatedly conversed, there is an idea that everything is abnormally dear in North America, the good wages being therefore reduced of their charm, and that the employé is worse off there than in Europe.

From the writer's long observation, it is his studied opinion that the American mechanic is quite three times better off than the Spanish *mecánico*, nearly three times so than the French *méchanicien*, twice better situated than his English brother. That is, all things considered.

Engineer chiefs in the Spanish workshops will receive from 1,000 to 1,500 duros annually, and engineer inspectors of the permanent way up to $2,000. Where there are foundries in the sheds, puddlers earn from four to six pesetas daily (80 to 120 cents U. S.).

The Opening of the St. Clair Tunnel.

Last Saturday, Sept. 19, the official opening of this great work was celebrated with due ceremony. Sir Henry Tyler and the directors of the Grand Trunk Railway and of the St. Clair Tunnel Company had invited many guests from the United States and Canada and from England, and a very distinguished company was assembled. The party was taken through the tunnel by a special train consisting of five new day coaches built for the Chicago & Grand Trunk. The decapods designed for handling the tunnel traffic were not in service, but one of them, under steam and handsomely decorated, was seen at the Port Huron end of the tunnel. These engines were described, with illustrations, in the *Railroad Gazette* of April 3, 1891. They weigh, in working order, 195,000 lbs., which is carried entirely on the drivers.

The tunnel was approached at either end through handsome arches of flowers and foliage, and was lighted by incandescent lamps which are part of the permanent plant. The train stopped at the Sarnia end, before entering the cutting, and the Mayor of Sarnia made an address to Sir Henry Tyler. At the Port Huron end the Mayor of that municipality presented another address. To both of these Sir Henry replied with much spirit and felicity. The party returned to Sarnia by boat. A banquet was spread in the freighthouse near the Sarnia station, which was beautifully decorated for the occasion with wreaths of verdure and with flags and appropriate mottoes. Between 200 and 250 persons sat down to the tables. All of the arrangements had been made with great thoroughness, so that there was not the slightest delay or confusion in the seating of the guests. The banquet began at about half-past two, and the speaking did not cease until after six.

Sir Henry Tyler presided, and spoke not only well, but happily, in giving toasts. The two facts most prominent in the numerous speeches were the feeling of the assemblage in the matter of commercial relations between Canada and the United States, and the handsome appreciation of the work of Mr. Hobson and his subordinates. The whole tone of the speeches and of the audience, almost without exception, was in favor of untrammeled commercial intercourse between the two countries. This was the point which was dwelt upon over and over again, and always with enthusiastic approval. Little was said as to the special means to be adopted in bringing about this freedom, but the sentiment in favor of it was wonderfully marked. Sir Henry Tyler spoke in a very handsome and appreciative way of the work done by Mr. Hobson and his assistants, and Mr. Hobson was greeted with demonstrations of admiration and good feeling. Certainly his work was appreciated by the guests of the day.

In the *Railroad Gazette* of Sept. 26, 1890, this tunnel and its objects were described in considerable detail, and probably the facts concerning it are sufficiently well known to our readers without further statement of them here. We take this occasion, however, to repeat what we have said before, that the use of the shields in the construction of this tunnel was so original in design, so great in magnitude and so bold and successful in execution that the system might with great propriety be called by the name of Mr. Hobson, if we are to abandon the name of Mr. Beach in connection with it, although it seems as if historical justice requires that it should be known as the Beach system.

Although the tunnel shields met Aug. 30, 1890, it has not yet been opened for traffic, but probably will be in a very few days. The delay has been occasioned entirely by extraordinary difficulties met with in completing the cuttings. These, it will be remembered, have an extreme depth of 75 ft., and are through blue clay. The delay in completing the approaches has come from the sliding of the sides of these cuttings at both ends of the tunnel, and in each case on the north side of the cut. Extensive pockets of quicksand have developed, and have caused immense masses of the material of the slopes to slide in. Portions of the heavy retaining walls have been lifted up bodily and carried away from their positions. There appeared to be but two things to do—to increase the slope of the cuttings and to carry away the material as fast as it came down, until finally the sliding should cease. The slope has now been made 3 to 1, in terraces, and it is believed that there will be no more trouble from the sliding.

It will be remembered that the tunnel is built for a single track. It is equipped throughout with incandescent electric lamps, which will probably be left in for permanent lighting, although it is not definitely decided yet whether or not the tunnel will be lighted in operation. The engines used will burn coke. The steam and vitiated air will be taken out by fans, pipes having been arranged through the tunnel for that purpose. On the day of the opening the blowing engines were not at work, consequently the lights became invisible, except for very short distances away from them, before the tunnel had been more than half traversed.

The whole structure is a beautiful one to look at from an engineering standpoint, and there is no question that it is a great technical success, whether or not it proves to be a commercial one.

Methods of the Car Record Office.

The *Official Railway Equipment Guide*, which apparently holds the position of official mouthpiece of the International Association of Car Accountants, prints in its September issue a further installment of papers presented at the sixteenth annual convention of that association at Denver three months ago.

The most practical paper is one by A. Hale, of the Pennsylvania, detailing the experiments he has made during the past few years in the endeavor to find the most economical plan of keeping the records of the immense car movement on his road. The principal divisions of the roads under Mr. Hale's supervision centre at Harrisburg, Pa., and one of his schemes for reducing the "lost motion" in recording cars was to divide the territory at that point, keeping the respective sections on either side entirely distinct, as though they were separate roads.

For the benefit of interested readers who are no familiar with car service records and who have not read Mr. Edmund Yardley's interesting accounts of work in this department (heretofore printed in the *Railroad Gazette*), a brief explanation of what is meant by "lost motion" may be in order here. The records of movements of freight cars are kept on large books in which a certain space is allotted to each number, ranging from one up to the highest number that would ever be required. Thus a car numbered 25,000, whatever its initials, must always be entered in the column allotted to that number, and this column, headed with the number, is made of sufficient size to record the initials, station from, station to, and date for the probable number of movements during a given time, say one year. The car recorder, on receiving a conductor's report containing the numbers of say from 20 to 80 cars, must take the report and go to each one of the books containing the numbers which appear on the report. It will be seen that a single report may often have a sufficient variety of numbers to require the clerk entering them to open every one of the 20 to 80 books which have to be kept. The time wasted in traveling from one desk to another for this purpose is of course a considerable item. This was Mr. Yardley's scheme when he adopted the piecework system, instead of placing each book in charge of one or (at most) two men. With this last-mentioned plan the conductors' reports are passed along from book to book, each clerk picking out and recording such numbers upon it as belonged to his book. As business grew, however, things came to such a pass that a clerk would often look through a list of 75 numbers and find only one to be entered upon his book. This unproductive labor is what is termed "lost motion." Mr. Yardley's plan only shifted the loss without removing it; and the neatness of the bookkeeping suffered when there was no one man responsible for the condition of the records.

Mr. Hale's division of territory reduced this disadvantage, but the record of interchange from one division to another at Harrisburg, which was then necessary, neutralized the advantages gained. About 5,000 cars pass through Harrisburg daily, making 10,000 records to be kept, requiring perhaps 10 additional clerks. Mr. Hale did not keep this interchange record, however, and so gave up this plan.

The temporary use of the per diem agreement by the roads in the Pennsylvania system necessitated some changes, and Mr. Hale made various modifications in his plans, putting on a night force at one time (which, however, was found to introduce numerous intolerable complications), and separating the box car record from the gondola car record. Assigning men to carry reports down the line of desks, calling off the records as they passed the proper men, putting on more foremen, keeping junction reports on a separate record, and other hopeful experiments, proved only palliatives of the difficulties, and finally a system similar to a card catalogue was adopted. Conductors' reports were handed to "copyists," who copied the record of each car by itself upon a small slip of paper; these slips were sorted by boys according to the hundreds which the numbers represented, and were then handed to "boxers," who sorted them into the boxes containing the cards which bore the records, one card for each number. Each five boxes were set in a drawer and 10 drawers were placed in each case. This record was cheaply kept, but was, after all, given up because tracing clerks found that it took a much longer time to hunt up records, and because the responsibility for errors in recording could not be located.

Mr. Hale has now gone back to the record books, each book holding twice as many numbers as formerly, the conductors' reports are handed to copyists, there being a copyist for each division of the road. Each copyist copies all the records from a report upon a set of indexed sheets, one sheet for each book. When a sheet is full it is taken to the proper book. This rule being, however, subject to the exception that when there are 10 numbers on any one conductor's report that belong on a single

book, the report is taken directly to that book, thus saving copying. Without this saving the plan would be too expensive, but with it there is a saving.

Mr. J. R. Kavanaugh, of the Chicago, St. Paul & Kansas City, read a paper on "The Car-service Department of the Future," in which he advocated the keeping of the railroad mail service account and the switching accounts, grain door records, seals and seal records by this department, as well as the supervision of fast freight movement and the distribution of passenger cars. Mr. C. H. Cannon, of the Great Northern, described the practice of his office in keeping the record of locomotive performance, which has been done since April, 1888. The record is a useful check on errors of enginemen and timekeepers, and is believed to be worth many times its cost.

The Hall Signal Co.'s Mechanical Interlocking.

The Hall Signal Co., of New York and Chicago, which has hitherto confined itself to electric signals, has recently taken measures to add a department to its shops for the manufacture of mechanical interlocking machines, as well as signals and the usual accessories, and an 8-lever interlocking machine built by the company is now on exhibition at its office in New York (50 Broadway).

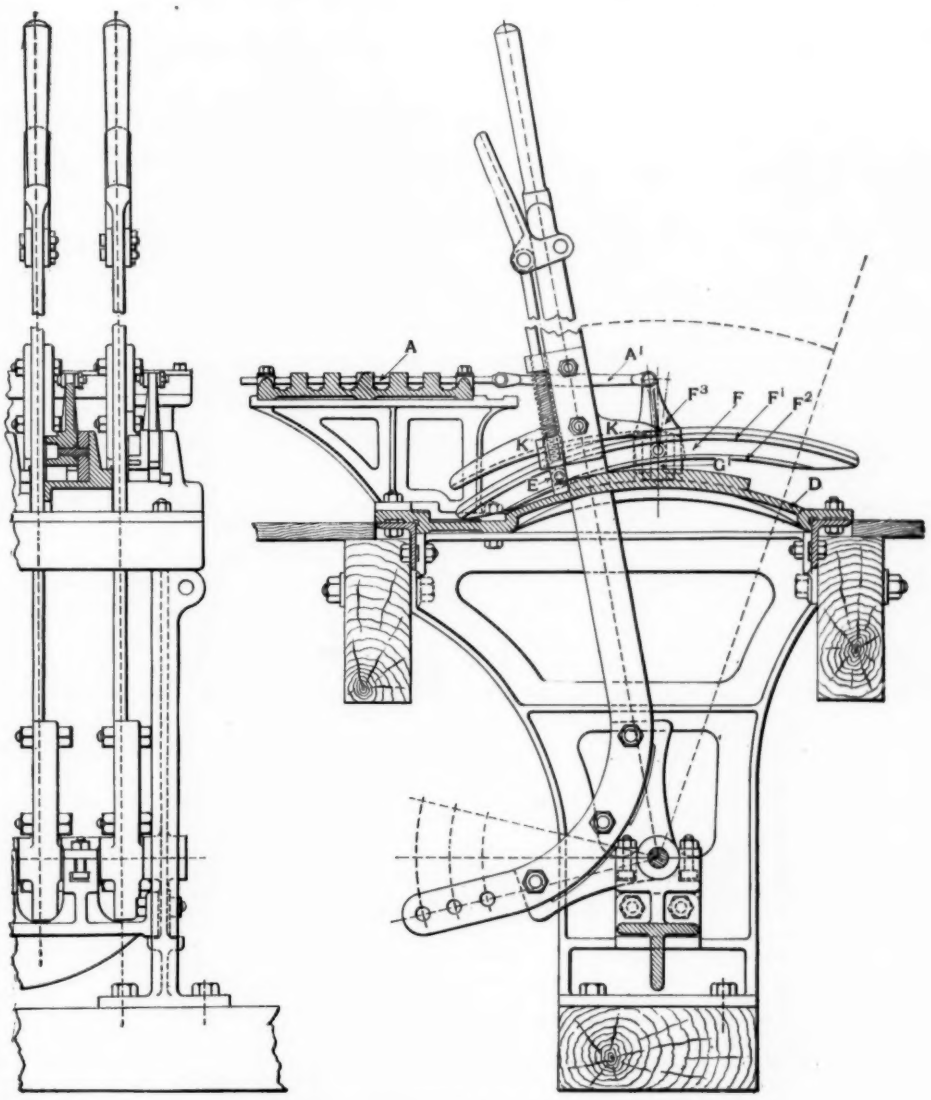
The accompanying figure shows the style of the machine. The locking is of the ordinary Stevens type with mitre locking. The chief peculiarity is the movable pivot for the rocker, this feature having been invented by Henry Bezer and Thomas W. Burley, who have applied for patents upon it. Mr. Burley is signal engineer of the Lehigh Valley, and Mr. Bezer, who was formerly connected with the English signal manufacturer, Sykes, is now employed by the Hall company.

The principal claim made for this machine is that excessive wear and strain on the lever and on the frame generally, are obviated by pivoting the arm $F3$, at its lower end and the rocker F on a pin which slides up and down in a bracket fixed to the frame. All the locking and its actuating mechanism are above the floor level.

There are ribs F^1, F^2, cast on the rocker F, and within them fits the roller E. When the catch rod is lifted, the catch is clear of the projection on the stationary segment D, and the roller E will have raised the rocker F. Then the upper face of the rib F^1 will be against the shield K. The arc of that face of K which engages with the rib F^1 is concentric with the lever; also the faces of F^1, F^2, when the rocker F is raised as just described. The adjustment of the catch rod is such that when the clutch is brought against the lever the lower end of the catch rod is just clear of the projection on D and F^1, and therefore the rocker F is controlled by K. Although not compulsory, it is preferable to grasp the clutch and the lever H when moving the lever to either position. This keeps the catch rod just clear of the projection on D.

It will be seen that throughout the movement of the lever there is next to no movement possible for the rocker F, because of the control of the shield K. Even if, in consequence of wear or inexact fitting of parts, it became possible to bring the rocker F to a position eccentric with the lever, the slide G^1, to which the rocker F is pivoted, can rise with the rocker, so that there would always be a path for the roller E without that kicking and breaking strain which would result were the rocker pivoted to a fixed base. In other words, as the rocker is pivoted to a movable base, it can adjust itself concentrically with the main lever.

It will be understood that when the catch rod is lifted from one end of the projection on D and is dropped into the other end, the rocker F, through arm F^3 and link A^1, operates the tappet A in the usual manner, and that the movement of the tappet A can be the minimum of what the mitre locking requires, because of the rigid conditions of the rocker F during the movement of the lever H from one position to the other.



INTERLOCKING MACHINE—HALL SIGNAL COMPANY.

Manganese Steel.

In a paper read before the American Society of Mechanical Engineers, at Providence, in June, Mr. H. M. Howe brought forward the most prominent characteristics of manganese steel.

Starting with the fact that small proportions of manganese have but little effect on the hardness, strength or ductility of iron, he placed the first visible predominant effect at about 2.5 per cent. Then, "as the proportion of manganese rises above 2.5 per cent. the strength and ductility diminish, while the hardness increases. This effect reaches a maximum with somewhere about 6 per cent. of manganese. When the proportion of this element rises beyond 6 per cent. the strength and ductility both increase, while the hardness diminishes slightly, the maximum of both strength and ductility being reached with about 14 per cent. of manganese. With this proportion the metal is still so hard that it is very difficult to cut it with steel tools. As the proportion of manganese rises above 15 per cent. the ductility falls off abruptly, the strength remaining nearly constant till the manganese passes 18 per cent., when it in turn diminishes suddenly." "Steel containing from 4 per cent. to 6.5 per cent. of manganese, even if it have but 0.37 per cent. of carbon, is reported to be so extremely brittle that it can be powdered under a handhammer when cold; yet it is ductile when hot." Another instance where the properties of the alloy differ widely from the mean of the properties of the components.

The paper then dealt exclusively with the great hardness of the metal combined with its high tensile strength, and astonishing toughness and ductility, merely mentioning the other properties of freedom from blow holes, difficulty of welding, increase of toughness by quenching from a yellow heat; its enormous electrical resistance, and low thermal conductivity.

In its resistance to abrasion manganese steel excels all other steels when tested on an emery wheel, but when applied to a smooth revolving shaft it falls below blue tempered hard tool steel by 60 per cent.

As for the hardness of manganese steel, it "seems to be of an anomalous kind. The alloy is hard, but under some conditions not rigid, as it can be bent double cold without cracking. It is very hard in its resistance to abrasion; it is not always hard in its resistance to impact."

Reference is not made "to the mere fact that it can be indented by a sharp blow," for "this power of enduring distortion is almost a necessary consequence of its great ductility;" but "to its behavior under conditions like those of a hammer head," where it has not met the expectations of its promotors.

In testing the metal in the shape of car axles, it withstood blows representing 43 per cent. more energy, yet with a very much less total deflection than the carbon axle with which it was compared before breaking. Again, in comparing a manganese steel car wheel weighing 612 lbs. with cast iron wheels from the best makes, the total energy represented by the work done in breaking the former was 18 times as much as in the case of the latter.

It is in the field of car wheel work for passenger cars that the author expects to find one of the widest applications of the metal.

"To sum this up, in resistance to abrasion alone, manganese steel excels the hard carbon steels (when unhardened) and *a fortiori* the soft steels. Where both abrasion and repeated shocks are to be resisted, manganese steel is certainly less liable to break than the hard carbon steels; but whether, under new conditions, combining shock and abrasion, it will prove as rigid as the carbon steels with which it will then have to compete, direct experiment alone can tell."

The peculiar properties of the metal naturally raise numerous problems for its successful and economic working. But inasmuch as it forges readily at a yellow heat, it is suggested that it be worked in this condition to a shape more nearly coinciding with the finished lines than is usually done. Still there must be a certain amount of cold working done, and the emery wheel which cuts manganese steel very readily is the resort.

It has been found that this steel is peculiarly well adapted for use in bridge pins, as the wear of those in service is very much less than carbon steel. At first the problem of cutting the thread for the lock nuts was a serious one, but it has been solved by using Wyman & Gordon's machine for forging threads. While the metal is quite ductile its resistance to drawing is so great, and it requires such frequent annealing, that it is doubtful if it meets with a very wide application in this direction. Up to the present time the established uses for manganese steel are few. The most important use is as the pins for holding the buckets of dredgers, then comes that of links in common chain elevators. The cyclone pulverizer is made with blades of manganese steel, where it has been found to fill every requirement. "A great many points and crossings have also been made for both steam and horse railroads, but it is not yet known how the wear of manganese compares with that of carbon steel under these conditions."

"Finally, it is to be expected that manganese steel should make excellent armor plates, for here hardness and toughness should be combined. The plate must be so hard that the shot does not penetrate it, yet so tough that it does not crack and let the water in; and such experimental data as we have, indicate that it will fulfill this expectation."

From all that has thus far been learned then it is safe to assume that despite the difficulties in its manipulation that would seem at first sight to act as a barrier to its introduction, the peculiar hardness, tensile strength and ductility of manganese steel must serve both to "create and limit its value in the arts."

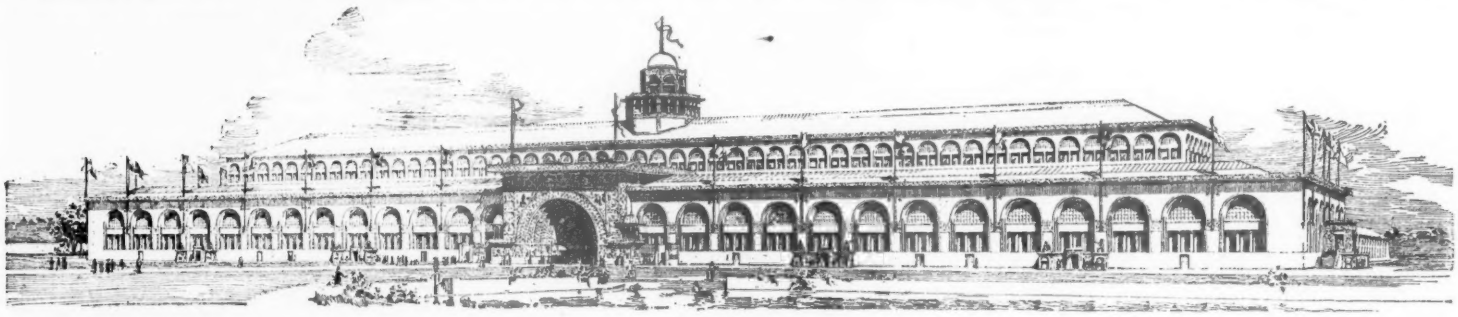
The Department of Transportation at the World's Fair.

The Department of Transportation is to be one of the great coördinate departments of the World's Columbian Exposition, and it is the intent that this department shall fully present the origin, growth and development of the various methods of transportation used in all ages and in all parts of the world. Past history will be illustrated, and it is hoped, that, in the interest of historical accuracy and the preservation of important relics which are now daily passing away, the attention of the

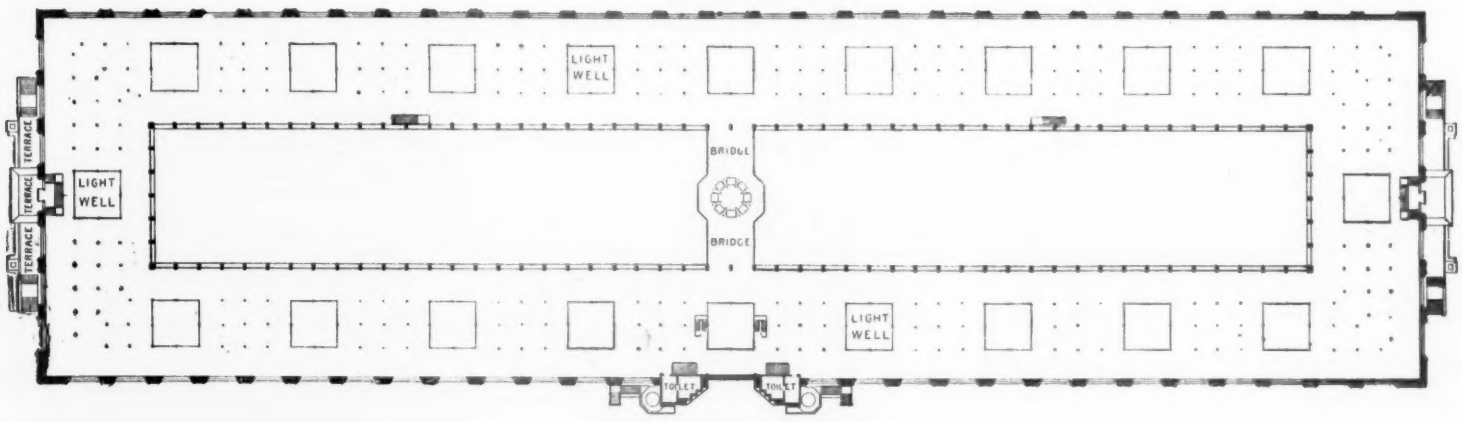
Department of Transportation Exhibits may be called by its friends in all parts of the world to exhibits of this kind which may be secured.

The development of water craft from the crudest forms to the modern ocean steamship; of wheeled vehicles from the first inception of the idea of the wheel to their present seeming perfection; and of the railroad will also be further illustrated by models, drawings, plans and designs in cases where the actual apparatus, appliance or machine itself cannot be exhibited.

The Railroad Exhibit.—A space of over eight acres is devoted to this interest, and as far as possible arrangements should be made by joint agreement for showing everything in its proper place and relations. Locomotive appliances can best be shown on locomotives and the appurtenances and furnishings of cars on cars. Specimens of standard permanent way will afford opportunity for showing track materials, tools and all that appertains thereto in the best possible manner. It is believed that nearly all of the establishments engaged in locomotive, car and bridge building, will be represented.



Front Elevation.



Floor Plan of Entresol.

WORLD'S COLUMBIAN EXPOSITION—DEPARTMENT OF TRANSPORTATION EXHIBITS.

A large number of the leading railroads of the world will also make exhibits of their standard roadbed, track and equipment. Abundant space has been designated and reserved for foreign countries; and every possible facility will be afforded foreign exhibitors.

Surface, underground and elevated railroads are to be shown very completely in this department. Everything relating to their permanent way and equipment is here included—with the single exception that electric motors must be shown in the Department of Electricity. Cars and other supplies for electric roads belong in this department.

Marine Transportation.—Every known method of transportation on water may be shown in this division. Small craft of all kinds may be exhibited in full size—vessels, from the nature of the case, must be shown by models. For fuller illustration, drawings, plans and paintings will be shown. Principal attention will be given to the merchant marine. The navigation of the inland waters of the world, especially of the great lakes and rivers, will doubtless be illustrated more fully than in any previous exposition. The classification provides, also, for everything of interest connected in any way with the subject of navigation. Foreign governments, builders of such vessels throughout the world, and manufacturers of naval supplies, are invited to exhibit, and are assured of every consideration. The separate exhibit of the United States government will not prevent a representation of its naval history and its present plans by means of models, etc., in this department.

The Building.—The building for the display of transportation exhibits is near the main entrance to the grounds. It is surmounted by a cupola reaching a height of 165 ft. Eight elevators will run from the centre of the main floor to balconies surrounding the cupola at heights of 115 and 128 ft. The architects of the building are Messrs. Adler & Sullivan, of Chicago. The main entrance will consist of an immense arch, decorated with carvings bas-reliefs and mural paintings. It will be treated entirely in gold leaf and will be known as "the golden door." Numerous minor entrances are provided, as shown in the plans, and with them are grouped terraces, seats, drinking fountains and statues. The interior of the building is treated much after the manner of a Roman basilica with broad nave and aisles. The roof is in three divisions; the middle one rising much higher than the others and its walls pierced to form a beautiful arcaded clere-story.

The main building covers a space of 960 ft. in length by 256 ft. deep—but as shown in the plans the main floor includes nearly nine acres of additional space under roof. The total floor space, including the entresol, is nearly seventeen acres. A 75-ft. transfer table will traverse the annex, along the western line of the main building. Railroad tracks will be laid in the annex at right angles to the transfer table. The heaviest locomotives and cars can be run direct from the installation track, which runs alongside the southern end of the building, upon the transfer table, which will take them to their proper track inside the building. The length of these tracks is such that an entire train can be shown connected as when in actual use. When installation of heavy exhibits has been completed, the pit of the transfer table will be floored over. The annex will open into the main building in such a manner as to afford long and striking vistas down the main avenues and aisles.

The Principles of Train Dispatching.*

The telegraph as a means of directing the movements of trains, is a necessary railroad fixture. But for its agency the moving of the heavy traffic of some of our railroads would be impossible without large additions to the tracks and consequent increase in the cost of construction and transportation. The train wire is thus a promoter of both economy and facility of operation. Under the supervision which it permits the products of industry are rapidly and cheaply exchanged between distant points, while the traveler, unimpeded by the slower moving trains, goes swiftly on his way. Steam is the noisy giant that shoulders the load and gets the praise; but the silent man, in some quiet place away from the rattle of the wheels, with his finger on the key, controls the ponderous and complicated movements, which proceed so harmoniously that one may almost imagine them to be the result of natural law.

The distinctive feature of the "American" system of train dispatching is the issuing of orders from a central office, directing train movements, supplementary to those provided for by the time table and train rules. This method is in general use, and is recognized as better adapted to our circumstances than that of moving trains by the "staff" or other means from station to station, as in European practice. In considering the application of this mode of issuing telegraphic orders for single track, some of the methods will be seen to apply as well to roads having more than one track.

A printed time table, showing the regular times and meeting places of trains, may be prepared at leisure and studied by all trainmen, and is full notice as to all regular trains on the road. With rules added directing how the trains are to proceed with relation to each other, understood by all alike and faithfully observed, collisions cannot occur. If, however, it becomes necessary to issue special orders for trains that are not on the time table, or for the forwarding of any, otherwise than by the operation of the ordinary rules, new precautions become necessary.

The conductor or engineman receiving such an order must know *that it is given by competent authority.*

It must be understood *that others concerned have corresponding orders.*

These orders should be *so clearly expressed that they cannot be misunderstood,* and they should be forwarded and delivered *under such safeguards as to insure their certain and correct reception by the proper persons.*

As these orders are to be acted upon at once, without opportunity for careful study, *their form, and even the paper on which they are written, should be such that they may be easily and quickly read and comprehended.*

It is now generally agreed that *orders of this kind should be issued by a designated dispatcher,* acting by the authority and in the name of the superintendent. For two persons to engage in this work at the same time for the same piece of road involves serious risk, and to insure safety as well as confidence on the part of the trainmen this should never occur. It may be taken as an initial principle that *the success of a system depends largely upon the assurance upon the part of the trainmen that every source of danger has been carefully considered and guarded against, and that the rules adopted are strictly adhered to.* If it were known, for instance, that orders were issued by the superintendent and one of his assistants alternately, as might be convenient at the moment, it would excite distrust. . .

Extreme care is necessary to carry out exactly the methods fixed upon for the proper preparation and issuing of these messages, and confusion is likely to result from interference with those charged with this duty.

In issuing a time table in advance of the date upon which it takes effect, means can readily be used for making sure that it is received by those who are to be governed by it. The means are more complicated and subject to greater risks whereby we can be assured that a telegraphic train order reaches correctly and surely the hands of those for whom it is designed. After preparation by the dispatcher it is transmitted in telegraphic language by mechanical agency to a distant point, there to be retranslated into plain English and written out without mistake, for record and delivery; and all this in the shortest possible time.

The details of this process should be so arranged as to guard as far as possible against every risk arising under the several steps, and *nothing should be left to mere personal care that can be provided for by fixed methods of proceeding.* To one who is an expert and can see in his own case no occasion for extraordinary safeguards such precautions may not seem important; but a consideration of the risks involved, of the many steps to be taken and of the number of agents engaged in the process, many of whom are often not greatly experienced, must lead to the conclusion that *a methodical following out of a carefully prepared mode of proceeding* is a most valuable means of providing against many of the chances of failure.

Two general methods or systems of constructing train orders are in use. They have been distinguished as the "single order" and "duplicate order" system. The latter is accurately described by its title. The other title is not a strictly accurate designation, but sufficiently so for our purpose. Although the "duplicate" method is now widely recognized as the best, the other is still in use. For purposes of comparison of these methods we will take a telegraphic order providing for the meeting of two trains at a designated point beyond which the one has, by train rules, the superior right of track as respects the other. The order is to limit the superior right, and permit the inferior train to run to a point to which it could not otherwise go without trespassing on the right of the other. If by any error or misunderstanding the superior train fails to stop at the proposed meeting-point, while the other proceeds upon the assumption that it will thus stop, the result may be a disastrous collision. Under the "*single order*" system, when two opposing trains are to meet by special order, arrangements are usually first made to stop the superior train by a "holding order." An order is then given forbidding it to go beyond the designated point, and then another order is given to the inferior train authorizing it to go to that point. The holding order is addressed to an agent or operator whose station the superior train will pass, and reads substantially as follows:

Hold train No. 5 for orders.

. . The order to the superior train would read:

You will not pass Alton until train No. 4 arrives.

*Extracts from Chapter I. of the "Train Wire," by J. A. Anderson, just published in the *Railroad Gazette.*

The corresponding order to the inferior train will read:

You will run to Alton regardless of train No. 5.

or perhaps—

You will meet and pass train No. 5 at Alton.

The holding order is dispensed with by some.

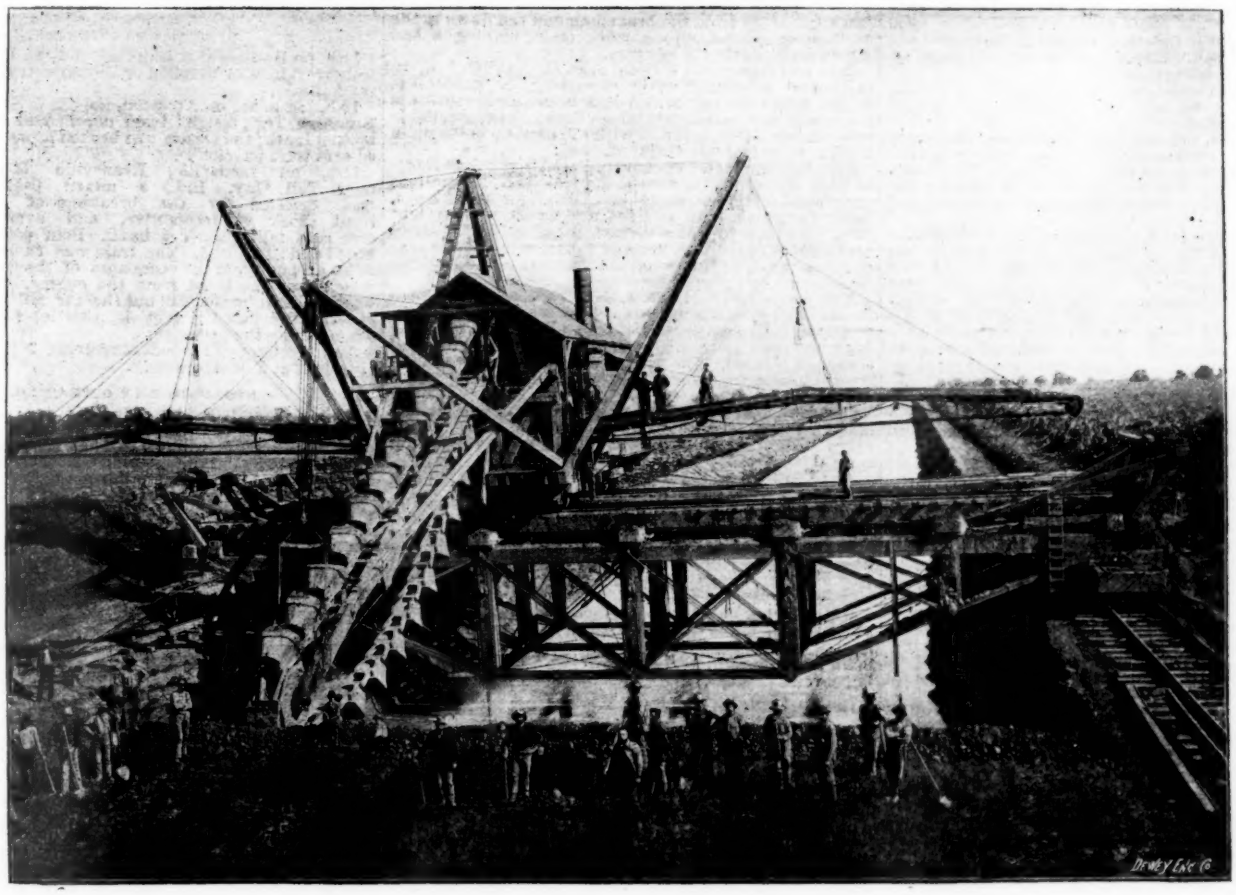
The "*duplicate*" system, as its name implies, requires that *the order given to each train shall be a duplicate of that given to every other train* concerned in the movement provided for in the order. An order is addressed to the conductor and engineman of each of the two trains, *in the same words*, as follows:

Trains No. 4 and No. 5 will meet at Alton.

This, being in the same words to each, may be transmitted over the wire to both at the same time. This is usually done, and offers one of the chief advantages of this form of order. Objection has been made to the 'duplicate" form that it does not distinctly order a train to proceed farther than its schedule rights permit, nor in definite terms direct the other not to go beyond the new meeting point. The objection has no weight, as an order to meet can only be construed as authorizing each train to go to the station named, and not beyond it until both are there; and it is easy and proper to provide a rule which shall definitely settle the point for those who are unaccustomed to this form, if it should be deemed necessary.

The fatal defect in the "single order" system is that the orders to the two trains, written separately and differently expressed, are subject to the grave danger of inadvertently giving in one a meeting place different from that given in the other. This liability is greater if an interval of time occurs between the preparation of the two. The risk is very much increased by the usage under this system of including several meeting points in one order, and becomes still more serious if meeting points are to be made for several trains moving in each direction. The schedule for these must be rapidly made up and written out in parts, giving to each train its part, differing in form from all the others. There is nothing but the care and skill of the dispatcher to prevent the opposing orders from differing in some particular. When we consider the care necessary in preparing a time table, to properly show the running time and meeting places of the several trains, we must see that the risk, in the process described, of getting something wrong, must far outweigh any supposed convenience in a train having an order showing a continuous schedule of its meeting points for several opposing trains. Those unacquainted with this work would be astonished at the extent to which the skill of some dispatchers in this direction has been developed. To the uninitiated the mental operations would be simply bewildering, which are required of a brain from which issue for hours, without apparent effort, the instructions under which the trains on a busy road are moved expeditiously and harmoniously. It is not to be denied that many men have moved traffic of huge dimensions safely and with entire satisfaction by the "single order," but this does not at all prove that the system possesses inherent principles of safety. Great personal ability and skill have, with it, achieved marked success where in less able hands its defects would have become apparent; but that some have developed this remarkable ability is no reason why we should depend upon this in a matter of such vital importance. The prevalence of methods which require exceptional skill has doubtless interfered with the more extended usefulness of the railroad telegraph which would probably have resulted under a system more readily operated by men of less experience and ability. . . . A mode of constructing orders which may be operated with safety by men of moderate skill, which relieves them of the mental strain, and *which in itself provides against the most serious chance of error* must at once commend itself. The "duplicate" meets these requirements. In preparing this order the dispatcher cannot possibly give different meeting points, as there is but one message for both trains, and when transmitted to both simultaneously each must get the same as the other. The mental anxiety arising from the other method is absent in this. An experienced dispatcher under the "single" system, has stated that in visiting an office where the "duplicate" was used he was surprised that those engaged there appeared to have so little on their minds. He found, on himself adopting the "duplicate," that it was readily explained. Each transaction is at once complete. On the preparation and transmission of the order in precisely the same language to both trains, and with no necessary connection with any other transaction, the mind is at once prepared to dismiss that and go on to the next. In the transmission of two separate orders for the one meeting, there is ever the feeling that an error may be or may have been committed. But where the one sentence is prepared for both trains, the dispatcher may rest secure that *no collision can occur from any oversight of his in preparing the orders.*

The power of combination and of quickly calculating the probable movements of trains and determining what shall be done is an entirely distinct matter. This power is largely the result of experience. It is essential to the full development of any system, but it is exercised with much greater facility under the relief which the "duplicate" affords. Superintendents moving a heavy traffic, who have changed from the "single" to the "duplicate," state that the amount of telegraphing is reduced one third. It may seem difficult, perhaps unsafe, to undertake to re-educate operators and trainmen in so critical a matter. Nevertheless, those who have tried it have found these supposed difficulties to quickly vanish. Some officers who were with difficulty induced to change are now among the most enthusiastic supporters of the "duplicate" method.



THE CANAL EXCAVATOR OF THE SAN FRANCISCO BRIDGE COMPANY.

A New Canal Excavator.

In the fall of 1889 the San Francisco Bridge Co. took the contract for a canal about six miles long from the Sacramento River to Stony Creek, calling for the excavation of about 1,250,000 cu. yds. The average depth is about 15 ft., while in some places it is 19 ft. 6 in., with a bottom width of 60 ft., and a top width of 100 ft.

To do this work the company used a machine of special design, which is illustrated by the accompanying engraving.

A railroad track of the ordinary gauge is laid along each bank of the proposed canal in short sections. Upon these tracks the two ends of the dredge are supported by means of three trucks upon each track, which carry the three trusses forming the span upon which the machine proper travels across the canal.

The excavating is done by buckets of the ordinary type, that drop their loads into a hopper that empties upon an endless belt conveyer, running in either direction out over the banks. The arms of the conveyer are of sufficient length to reach from the centre line well out over the banks at the widest points of the cut. As the machine crosses the centre line of the canal in its transverse motion the inclination of the hopper is changed, so that the material is dropped upon the conveyer extending toward the nearer bank.

After the machine has excavated all within its range, the buckets are lifted and the whole moved ahead eight or ten feet by means of wire ropes worked by steam drums and fastened to deadmen some 100 or 200 ft. ahead.

All of the movements of the machine are controlled by one leverman, who has five levers to manipulate, one for raising and lowering the bucket chain, one for moving the car to the right, another for moving it to the left, a fourth for hauling the dredge forward on the side tracks and a fifth for controlling the engine.

The weight of the excavator is about 300 tons, its capacity is probably over 90,000 cu. yds. per month, and it was built at a cost of $60,000. The design of the machine is novel and original, and in design and construction it is entirely the product of the Bridge Company. Its performance has entirely justified the experiment.

Train Accidents in the United States in August.

COLLISIONS.

REAR.

5th, on Pennsylvania, at East Rahway, N. J., a freight train broke in two and the rear section ran into the forward one, derailing and overturning a number of cars. The toppling cars killed a section man and badly injured another.

6th, about 2:40 a. m., on West Shore road, at Montezuma, N. Y., westbound express train No. 3, consisting of engine and 9 cars, ran into the rear of a preceding freight train of 40 cars which was just entering a side track. There was a dense fog at the time and the engineer of the passenger train had no time to reduce his speed after seeing the warning, which was but a very short distance back of the caboose of the freight. The smoking car, the occupants of which were mostly Italian laborers, was completely wrecked and 13 passengers were killed; 17 others were injured, of whom one died. The fireman and a car inspector on the freight were killed and the engineer badly injured. The wreck caught fire from the locomotive, and the baggage cars and a number of freight cars were burned up. The freight train broke in two while pulling into the side track, but the cars had been recoupled and the train was moving when struck.

7th, 4:20 a. m., on Pittsburgh, Fort Wayne & Chicago, at East Palestine, O., an eastbound passenger train moving at about 30 miles an hour struck a misplaced switch and crashed into some freight cars standing on a siding. Three of these and the engine were badly wrecked and a combination car and one sleeping car thrown over on their sides. Engineer and fireman seriously injured, and several passengers slightly hurt. A pedestrian was caught by the toppling cars and killed.

7th, 6:08 a. m., on Wabash road, at Homer, Ill., eastbound express train ran into the rear of a preceding freight which was entering a side track, damaging the engine and two baggage cars and wrecking four freight cars. Engineer, fireman and four other trainmen injured and a tramp killed.

10th, 6 a. m., on New York, New Haven & Hartford, at Branford, Conn., an empty engine ran into the rear of a work train, carrying a large number of laborers in a passenger car, which had stopped at the station for orders, injuring ten of the men, two of them seriously. There was a dense fog at the time, and it is said that the engineer of the empty engine did not properly heed the flag which was sent out. A large number of men got out of the car before the collision, having heard the flagmen shouting at the engineer. The uninjured laborers, who were Italians, attacked the engineer and fireman of the colliding engine, and threw stones into the cab. They were repulsed with difficulty.

11th, on Cincinnati, New Orleans & Texas Pacific, at

Winfield, Tenn., a freight train broke in two and the parts afterward ran together, damaging several cars and the engine. A tramp was killed.

11th, 4 a. m., on New York, Lake Erie & Western, near Port Jervis, N. Y., an east bound freight train broke in two, and the parts afterward ran together, wrecking two cars and injuring a brakeman.

12th, on Atchison, Topeka & Santa Fe, at Navasota, Tex., freight train ran into the rear of a preceding freight, wrecking engine, caboose and several cars. Engineer injured.

13th, on New York Central & Hudson River, near Poughkeepsie, N. Y., a southbound passenger train ran over a misplaced switch and into the rear of a work train standing on a side track, striking the cars at considerable speed after running several hundred feet beyond the switch. Several platform cars were wrecked and the locomotive was upset and tipped into the Hudson River. The fireman was slightly injured.

13th, on Fitchburg road, near South Lincoln, Mass., a local freight train ran into the rear of a preceding freight, badly damaging six cars. Two brakemen badly injured.

13th, on Pittsburgh, Cincinnati, Chicago, & St. Louis, near Columbus, O., a freight train broke in two and the parts afterward ran together, wrecking 18 cars and injuring a man in charge of a horse.

14th, On Columbus, Hocking Valley & Toledo, near Alvada, O., freight train ran into the rear end of a preceding freight which had broken in two, wrecking several cars and injuring the engineer and fireman.

15th, On Baltimore & Ohio, at Attica, O., an eastbound through freight train ran into rear of a local freight standing at the station, wrecking the engine and a dozen cars and badly damaging the station building. A fireman and brakeman injured.

16th, On Union Pacific, near Brighton, Col., a freight train ran into the rear of a preceding freight which had stopped on account of the disablement of the engine, wrecking the caboose and damaging the engine. Two unemployed trainmen who were riding in the caboose were instantly killed and a third badly injured. The wreck occurred on an open prairie, but there was considerable fog at the time. No signal had been sent back.

19th, on Baltimore & Ohio, near Gwynn's Falls, Md., a freight train which had stopped on a bridge was run into at the rear by a following freight, and several cars thrown into the valley 60 ft. below. One brakeman killed and two other trainmen injured.

19th, on Burlington, Cedar Rapids & Northern, at Elmira, Ia., collision between a passenger train and a freight train, damaging two coaches and the locomotive and several freight cars. An engineer was injured by jumping.

21st, on Southern California, at Los Angeles, Cal., passenger train ran into a freight car standing on the main track, smashing the freight car to pieces and slightly injuring several passengers.

22d, on Chicago, Milwaukee & St. Paul, near Oakwood, Wis., a freight train broke in two and the detached portions afterward collided, wrecking six cars. A following freight train ran into the rear of the wrecked train, and the engine, caboose and several freight cars were demolished. Four brakemen injured.

24th, on Baltimore & Ohio, near Martinsburg, W. Va., freight train descending a grade broke in two and the detached parts afterward collided, derailing eight cars and making a bad wreck.

30th, 3 a. m., on St. Louis & San Francisco, at Leona, Mo., a freight train, which had stopped for water, was run into at the rear by a following freight running at high speed, wrecking engine, caboose and six cars. Two trainmen and a drover were injured.

31st, on Eastern, of Minnesota, near Princeton, Minn., an engine and caboose ran into the rear of a preceding freight train, injuring the conductor and three brakemen. One caboose took fire and the men in it were rescued with difficulty. There was a dense fog at the time.

31st, on Baltimore & Ohio, in Philadelphia, Pa., passenger train struck a switching engine, badly damaging both engines and injuring one fireman.

31st, on Atchison, Topeka & Santa Fe, at Galveston, Tex., a passenger was injured by a slight collision between a passenger train and a switching engine, which was on the main track on the passenger train's time.

And 28 others on 24 roads involving 9 passenger and 37 freight and other trains.

BUTTING.

1st, on East Tennessee, Virginia & Georgia, near Dalton, Ga., butting collision between two freight trains, wrecking both engines and 9 cars. Fireman injured.

1st, on St. Johnsbury & Lake Champlain, near Danville, Vt., butting collision between a freight train and an empty engine running tender first, wrecking both engines and a number of cars. Five trainmen injured, both engineers seriously. The stove in the caboose was overturned and fired the wreck, which was partially consumed. The empty engine, having been deserted before the collision, ran back three miles, stopping only when steam was exhausted. It is said the freight was running against orders.

3d, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Skelley's, O., butting collision between two freight trains, due to an operator's failure to deliver orders, wrecking the engines and a dozen cars and killing a brakeman. One of the engineers in going back over the wrecked portion of his train afterward slipped and fell into a deep gully and was badly injured.

5th, 4 a. m., on Baltimore & Ohio, near Benson's Ferry, W. Va., butting collision between freight trains, second 89 west bound and second 92 east bound, wrecking ten cars, killing a man who was stealing a ride and badly injuring three trainmen. It is said that the conductor of the west bound train mistook an extra for the train he was waiting for at a meeting point.

5th, on Union Pacific, at Buttes, Wyo., east bound fast mail train ran over a misplaced switch into the head of a freight train standing on the sidetrack, badly damaging both engines. A mail agent was slightly injured.

5th, on Ogdensburgh & Lake Champlain, at Champlain, N. Y., butting collision between passenger train No. 63 and an excursion train which was to meet the regular train at Champlain. No. 63 had stopped and begun to set back, but the foremost cars in the excursion train were somewhat crushed and two passengers were killed. A dozen others were injured, of whom one died the next day. The coroner's jury found that the crew of the excursion train were not familiar with the road, and held the company guilty of gross carelessness in not providing sufficient seating capacity for the passengers in the excursion train.

11th, 10 p. m., on New York, Lake Erie & Western, at Kent, O., butting collision between two engines in the yard, one of which was pushing two cabooses. The other was running backward without a light. Of the six men on the cabooses two were fatally injured and the other four less seriously.

13th, on New York, Ontario & Western, near Guilford Centre, N. Y., butting collision between a freight and an empty engine. One engineer killed, and a fireman and a brakeman injured.

13th, on Pittsburgh, Cincinnati, Chicago & St. Louis, at Glendale, Pa., butting collision between a passenger train and a freight, due to a misunderstanding of orders, wrecking both engines. A trackman was injured.

17th, on Pennsylvania road, near Hunker, Pa., a car loaded with stone ran out of a sidetrack upon the main line, and struck the head of a passenger train at high speed, making a bad wreck, and killing the engineer.

21st, on Cincinnati, Wabash & Michigan, near Leesburg, Ind., butting collision between southbound passenger train No. 4 and northbound freight No. 15, wrecking the baggage and several freight cars. It is said that the passenger engineer mistook an extra freight for No. 15.

22d, on Northern Pacific, near Palmer, Wash., butting collision between eastbound freight 58 and westbound freight 571, killing an engineer and a fireman and injuring one other trainman. Both locomotives and several cars were badly wrecked. The conductor of train 58 failed to give his engineman a copy of the meeting order which he had received. A coroner's jury censured the railroad company for issuing train orders without requiring the signature of the engineman.

25th, on Roanoke & Southern, near Martinsville, Va., a platform car which was being loaded on the main track got away from the brakeman and ran down grade at high speed and into a work train, making a bad wreck and injuring 20 laborers.

29th, on Chesapeake & Ohio, near Craigsville, Va., an eastbound passenger train ascending a grade was struck by several cars which had been pushed out of a side track by a locomotive which became uncontrollable on a private siding, and ran, with the cars, upon the main track. Four trainmen injured.

29th, 5:30 a. m., on Pittsburgh, Fort Wayne & Chicago, at East Palestine, O., westbound freight No. 57 ran into the second section of eastbound passenger train No. 8, badly damaging both engines and wrecking 3 freight cars. Engineer and express messenger injured. There was a dense fog at the time and the passenger train was running slowly. The freight had orders to meet 3 first-class trains, but waited for only 2 of them.

29th, 4 a. m., on St. Louis & San Francisco, near Brush Creek, Mo., butting collision between freight trains, wrecking both engines and 15 cars. Loss $13,000. Both engineers and both firemen were killed and several trainmen injured. The eastbound train ran beyond the meeting point named in an order that had been given to it.

31st, on Union Pacific, near Muncie, Kan., butting collision between a work train moving backward and an extra freight train, wrecking caboose and injuring several laborers.

And 13 others on 10 roads, involving 8 passenger and 18 freight and other trains.

CROSSING AND MISCELLANEOUS.

1st, on South Carolina road, near Ridgeville, S. C., a passenger train running at speed struck a freight train which was crossing the main track, making a pretty bad wreck and injuring 3 trainmen.

4th, on New York, New Haven & Hartford, near West Haven, Ct., a passenger train ran into a freight train which was being carelessly switched across the main track, derailing 2 freight cars and slightly damaging several coaches.

7th, on Georgia Pacific, at Coalburg, Ala., caboose of a freight train wrecked by some coal cars which were pushed against it by a switching engine. A brakeman and one passenger in the caboose were injured.

10th, on Boston & Maine, near Great Falls, N. H., a freight train switching at the station was struck by another freight, wrecking several cars and slightly injuring two enginemen.

10th, on Delaware Railroad, at Farnhurst, Del., the engine of a freight train which, after taking part of its cars to the top of a grade, was returning for the remainder, struck the cars violently, wrecking the engine and one car. A brakeman standing on the tender was thrown forward and killed.

11th, 1 a. m, on Grand Rapids & Indiana, at Bryant, Ind., passenger train No. 5 ran into the middle of a freight train which was backing into a side track, wrecking several freight cars and the engine and mail car of the other train. Engineer and fireman killed.

13th, on Louisville & Nashville, at Clarksville, Tenn., a coal car got away from the trainmen and collided with a caboose, killing a brakeman.

13th, on Louisville, St. Louis & Texas, at Cloverport, Ky., a passenger train ran into the side of a freight train which was entering a side track, injuring several passengers.

14th, at 7 p. m., on Philadelphia & Reading, at Egg Harbor City, N. J., a passenger train approaching the station at too great speed ran into the side of a freight train moving backward through a cross-over, wrecking several box cars, both locomotives and a smoking car and one coach, and overturning a following coach. The smoker and forward coach mounted the engine and tender and several passengers were badly scalded. Engineer and 10 passengers injured. Another passenger was injured so that death resulted.

15th, on Rome, Watertown & Ogdensburg, at Utica, N. Y., passenger train ran into a New York Central engine which had been wrongfully permitted to run on the R. W. & O. main track. Both engines were badly damaged and the cars were all scraped on their sides. One engineer was injured.

25th, on Long Island road, at Valley Stream, N. Y., three loaded passenger cars, being let down a grade to be attached to a passenger train, were not controlled, and struck the rear of the standing train violently, doing considerable damage and injuring several passengers.

28th, on Cleveland, Cincinnati, Chicago & St. Louis, at Delaware, O., passenger train No. 2 ran into the engine of a freight train, wrecking both engines, a mail and a platform car. A boy stealing a ride was killed and the fireman injured. The freight engine was running on the passenger train's time.

30th, at 1 a. m., on Baltimore & Ohio, at Lodi, O., the rear car of an excursion train which was stopping on the crossing of the Wheeling & Lake Erie was run into by a coal train of the latter road running at considerable speed. The freight engine was overturned and two passenger cars badly wrecked. Four passengers were badly injured and a number of others lightly.

And 17 others on 16 roads, involving 8 passenger and 22 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

10th, on Kanawha & Michigan, near Charleston, W. Va., a trestle bridge gave way under a freight train and 14 loaded cars fell through and were wrecked. The train had stopped on the trestle and was just starting.

11th, on Union Pacific, at Lawrence, Kan., a Chicago, Rock Island & Pacific passenger train was derailed by a loose switchrod overturning the engine.

12th, on Baltimore & Ohio, near Landenburg, Pa., a passenger train broke through a trestle bridge which had been undermined by a freshet. Only two persons were in the passenger car and it appears that they escaped unhurt although the wreck was a serious one.

19th, on St. Louis, Alton & Terre Haute, near Parish, Ill., five cars of a freight train broke through a trestle and were wrecked.

25th, on Atchison, Topeka & Santa Fe, near El Paso, Tex., engine of a work train was derailed by a defective frog, killing conductor and brakeman; two other trainmen injured.

28th, on Little Rock & Memphis, near Argenta, Ark., a mixed train was thrown from the track by the spreading of the rails, badly damaging 2 coaches and several box cars. One passenger injured.

31st, on Southern Pacific, near Webster, Cal., passenger train derailed on a trestle by spreading of rails, caused, it is said, by expansion due to unusual heat. Four cars fell about 15 ft. Mail agent and 1 passenger killed, 3 employés and 7 passengers injured.

And 10 others on 9 roads, involving 4 passenger and 6 freight and other trains.

DEFECTS OF EQUIPMENT.

11th, on Baltimore & Ohio, at Chester, Pa., a car on a freight train was derailed by broken truck, derailing several cars.

12th, 1:30 a. m., on Atchison, Topeka & Santa Fe, near Brenham, Tex., freight train derailed on a trestle by a broken truck; the trestle was broken down and 11 loaded cars were wrecked.

31st, on Louisville, Evansville & St. Louis, near Tell City, Ind., a mixed passenger train was derailed by the breaking of a flange on front truck of locomotive, and overturned, several cars falling over a bank. Four passengers were killed and 20 injured. The train was running about 20 miles an hour, and the occupants of the passenger car, which was the third from the engine, were not very badly injured by the fall; but the car fell upon the engine, breaking off the whistle; this let steam into the car, scalding the passengers.

And 14 others on 14 roads, involving 3 passenger and 11 freight and other trains.

NEGLIGENCE IN OPERATING.

5th, on Grand Rapids & Indiana, near Kalamazoo, Mich., a passenger train running at speed was entirely derailed at a point where a rail had been carelessly left unfastened or the rail fastenings had been maliciously removed, the cars rolling down a 15-ft. embankment. About 60 persons were injured, though but 16 of them severely.

13th, on Southern Pacific, near San Francisco, a freight train was derailed by a misplaced switch, killing a trespasser who was riding on one of the cars.

15th, on Chicago, Milwaukee & St. Paul, near Cragin, Ill., engine of passenger train derailed by misplaced switch. Engineer hurt.

And 10 others on 10 roads, involving 3 passenger and 7 freight and other trains.

UNFORESEEN OBSTRUCTIONS.

1st, on Southern California, near Oceanside, Cal., passenger train derailed by running into a landslide. Engineer injured.

5th, on Western New York & Pennsylvania, near Kinsdale, N. Y., engine of a passenger train derailed at a washout, badly injuring fireman.

16th, on Atchison, Topeka & Santa Fe, near Hurdland, Mo., passenger train derailed by washout, engine and baggage car being overturned. The fireman was killed.

16th, on Atchison, Topeka & Santa Fe, near Hurdland, Mo., a freight train was wrecked by a washout wrecking the engine and two cars of stock.

19th, on Missouri Pacific, near Marshall, Mo., passenger train derailed near a bridge, the tender and baggage car falling through. It is said that the track was weakened by heavy rains. One passenger and two trainmen injured. The train was running slowly.

19th, on Louisville, New Orleans & Texas, at Robinsonville, Miss., twelve cars of a freight train derailed and ditched by running over a calf. A brakeman and a tramp injured and another tramp killed.

20th, on Louisville, New Orleans & Texas, near Cleveland, Miss., freight train derailed by running over a bull, killing a brakeman and two tramps.

23d, on Philadelphia & Reading, near Wernersville, Pa., a washout caused by a sudden cloudburst derailed and wrecked several cars of a freight train, badly injuring a tramp who was stealing a ride. The flood was a furious one and two cars were carried several hundred feet down stream.

23d, on Illinois Central, near Holly Springs, Miss., front truck of the engine of a passenger train was derailed by a piece of iron on the track at a point where a bridge was under repairs. It is believed that the iron was placed on the rail by malicious persons who intended to wreck the train. Two colored men were arrested and charged with the crime.

25th, on Southbound Railroad, near Campbelltown, Ga., mixed train derailed by a landslide, killing 1 passenger, and the fireman, conductor and 55 passengers injured.

27th, 2 a. m., on Richmond & Danville near Statesville, N. C., westbound passenger train No. 9 was derailed near Bastian's Bridge, and the whole train was overturned and fell about 80 ft. to the valley below, making a terrible wreck. There were 85 passengers in the train, and 18 passengers and 4 trainmen were killed, and 15 passengers and 2 trainmen badly injured. The water was dammed by the wreck and some of the victims were drowned. A coroner's jury rendered a verdict in which it is stated that they found evidence that the bolts and spikes of a rail had been taken out by some person with tools found in an open shed near by.

28th, on Atchison, Topeka & Santa Fe, near Willow Springs, I. T., a fast freight train ran over a team, and the engine and 9 cars were derailed and wrecked, injuring 4 trainmen.

29th, on Savannah, Americus & Montgomery, near Horton, Ga., a freight train ran into a washout, the engine and 11 cars being ditched. Conductor and several other trainmen injured.

29th, on East Tennessee, Virginia & Southern, near Gurnee, Ala., a passenger train was derailed by running over a cow, the baggage car being overturned and

wrecked. The fireman was killed and the engineer badly scalded.

30th, 3:30 a. m., on St. Louis, Keokuk & Northwestern, near Louisiana, Mo., engine of passenger train derailed and overturned, falling down a high embankment. Engineer and fireman badly injured. It is said that the rails had been maliciously loosened.

31st, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Mansfield, Pa., engine and five cars of a freight train derailed by a cow, injuring the engineer.

And 9 others on 8 roads, involving 5 passenger, 4 freight, and other trains.

UNEXPLAINED.

3d, on New York, Chicago & St. Louis, at Green Springs, O., a freight train was derailed, killing a brakeman.

3d, on St. Louis, Arkansas & Texas, at Belden, Tex., the caboose of a freight train was derailed and thrown off a bridge, severely injuring the conductor.

4th, 5 a. m., on Union Pacific, near McCammon, Idaho, passenger train derailed and ditched, four cars being overturned. Engineer and fireman injured.

4th, on Chicago, Milwaukee & St. Paul, near Mapleton, Ia., the caboose and one car of a freight train were derailed, killing a tramp.

5th, on West Virginia Central & Pittsburgh, at ——, a special engine carrying 17 roadmen and 2 women was derailed and overturned, killing one of the women and an employé, and injuring engineer and fireman and half a dozen other employés.

7th, on Chicago, Milwaukee & St. Paul, near Brookfield Junction, Wis., rear car of passenger train jumped the track while running at considerable speed. One passenger who jumped off was slightly injured.

11th, on Louisville & Nashville, near Michaud, La., gravel train derailed, making a bad wreck and injuring a brakeman.

16th, on Georgia Pacific, near Anniston, Ala., engine of a freight train derailed and overturned, killing the engineer. A fireman and two brakemen injured.

22d, on Louisville, New Orleans & Texas, near Lula, Miss., northbound freight train No. 18 derailed, killing and injuring three trainmen.

26th, on Chicago, Rock Island & Pacific, near Chicago, Ill., engine of freight train derailed and overturned, killing conductor and injuring 3 other trainmen.

26th, on St. Paul & Duluth, near Grantsburg, Minn., mixed train derailed and the passenger car upset, injuring 6 passengers.

28th, on St. Louis Southwestern, near Little Rock, Ark., mixed train derailed and ditched, one passenger being injured.

31st, on Union Pacific, near Fall River, Col., 4 cars of a circus train were derailed and a number of circusmen injured.

And 25 others on 21 roads, involving 6 passenger and 19 freight trains.

OTHER ACCIDENTS.

18th, on Pennsylvania road, near Jersey City, N. J., the side of a car in a passenger train was badly damaged by a loose door on a car in a freight train passing on an adjoining track. A passenger who was asleep with his arm on the windowsill was badly injured.

30th, on Louisville & Nashville, near Brock's Gap, Ala., a side rod of the engine of a freight train was broken, badly damaging the engine and injuring a brakeman.

A summary will be found on another page.

Avalanches in Austria and Switzerland.

Herr Vincenz Pollack, Chief Engineer of the General Direction of Austrian State Railroads, has published in the *Journal of the Austrian Engineer and Architects' Club* a paper on the avalanches of Austria and Switzerland and on the methods of protection against them.

The paper begins with an account in detail of the avalanche localities and a historical review of the effects produced. Herr Pollack has visited most of the sites in question, and has made a most fundamental study of the whole question. He has furthermore started a system of snow observation in the high Alps of Austria by readings on a gauge, accompanied by meteorological observations, in hopes of getting at the causes tending to avalanches, and also to enable the railroad authorities to know of the existence of specially dangerous conditions in the snow field.

Herr Pollack divides avalanches into two general classes—"Mass avalanches" and "dust avalanches." The former arise from the descent of bodies of snow or ice which have lain long enough to become compact, and have finally been started down by some slight change in condition, such as a fall of snow causing a disturbance of the equilibrium of the mass, or its undercutting by water.

Dust avalanches are the result of the descent of a mass of fallen snow, which is almost entirely dissipated into the air in its descent along the mountainside.

These two forms are of course differentiated into others under different circumstances, and also merge into each other at times. Thus a mass avalanche may, in the course of a long descent, become so much broken up as to take the form of a dust avalanche.

Brief mention of some of the avalanches described by Herr Pollack will show the action and power of those important factors in the railroad maintenance of Austria and Switzerland.

After a heavy rain succeeding deep snows on the 15th of January, 1884, a mass avalanche in the Steining ravine, near the south end of the Hallstadt Lake, in the Austrian province of Salzkammergut, descended into the Traun River, and, crossing it, covered the railroad on the further side for 190 ft. to the depth of 3 ft. According to the recollection of the writer, the Traun at this point is a stream 30 ft. or more wide and lying 10 to 15 ft. below the railroad grade. Reference is made to another avalance at the same time, and close by, which covered the railroad for over 800 ft. to the depth of 37 ft. It is not clearly stated on which side of the Traun the railroad was at that point, and as it crosses from one bank to the other one or more times in that meighborhood, if it happened to be on the mountainside at the point where the apparently greater avalanche came down, it is tolerably clear that the former phenomenon was the more striking.

The writer passed over the road in June, 1884, and the snow masses in the bed of the stream were at that time still conspicuous.

On the same section of track in February, 1888, other avalanches took place. One of these, a dust avalanche, passed entirely over the river without choking it up, and covered the railroad for 300 ft. from 12 to 19 ft. deep.

The most powerful action on the part of an avalanche recorded by Pollack is that of the Schoassen brook, on one of the Austrian roads. This occurred on the 14th of April, 1888.

The brook was spanned by a masonry arch of 45 ft. span, 15 ft. rise and 24 ft. wide, with the spring of the arch about 15 ft. above the bed of the brook. The avalanche destroyed the arch and cleared off the abutments nearly to the ground on one side, and down to 10 ft. above it on the other. The arch span was at right angles to the railroad, but the axis of the brook passed obliquely through the opening. The bridge lay in a kettle-shaped enlargement of the brook ravine, the fall of the brook being comparatively slight in this kettle. Above it extended a narrow and steep cañon which was bordered above the forest line by steep pastures. It is supposed that the snow torrent, dammed by the diagonal direction of the bridge, filled the opening, and thereby exercised vertical upward pressure on the arch, assisting the horizontal pressure of the oncoming snow in the work of destruction. The snow was left piled up 15 ft. over the railroad in such a compact mass that it had to be excavated with picks.

The importance of the avalanche question for the railroads and inhabitants of the Alps can be seen from the fact that in the winter 1887-8 in Tyrol and Vorarlberg 2,647 avalanches were reported, of which 1,355 are called regular, meaning apparently of every winter's occurrence. By these avalanches 53 persons lost their lives and 1,208 structures were destroyed. The damage was estimated at not less than $377,000. This too is in provinces where it has not heretofore seemed worth while to build protections such as have been put up extensively in Switzerland.

In Switzerland for the winter of 1887-8 there were reported 1,094 avalanches. It is probable that this list includes only those which descended into inhabited parts, inasmuch as their occurrence extends from Feb. 15 to May 10, while in the high Alps avalanches occur all the year round. Any one making an hour's stay on the Wengern Alp, opposite the Jungfrau, in the summer is pretty sure to see one or more avalanches down the face of the great mountain.

In Switzerland protection against avalanches has been of three kinds: First, arches over roads to let the snow pass over; second, masonry breast walls or jetties to stop or deflect the current of the avalanche; and third, apparatus for the purpose of preventing the snow from sliding on the fields from which it starts. The arches are effective in many places for the protection of a piece of road crossing a well-known avalanche course. The jetty plan is more general, but labors under the difficulty that the course of avalanches is uncertain. They naturally get into the ravines in the lower parts of their course, but these ravines are liable to become filled up with snow far above the level of the obstructions, and then the course of the avalanche becomes more or less erratic. The most perfect plan where circumstances will admit is the prevention of the sliding. It is obvious, however, that this plan is much interfered with by various practical difficulties. In the first place, the areas over which avalanches are liable to start are very large. Secondly, the usual method of preventing the slides is by setting posts in the ground. These cannot in many places be put down deep enough to be of any valne. Where they can be, the snow, after reaching to their tops, the height of which is of course limited, is liable to slide over them, making what is known as a "top avalanche."

The mass of these avalanches is in many cases enormous. On the 29th of March, 1888, an avalanche came down over the Gotthard Railroad covering the road for about 400 ft. to the depot of 50 ft. The snow was so compressed that picks were required to cut it out. The whole mass that descended was estimated at 351,000 cu. yds., enough to cover 10 acres of ground to the depth of 23 ft., or to fill Wall street from Trinity Church to the East River, 2,100 ft. in length, for 75 ft. in depth, viz., nearly to the tops of the highest buildings.

Apparently the oldest snow protection now existing is that built in 1719 and 1722 to protect the Baths of Leuk, at the south end of the Gemmi Pass, in Switzerland, from the destructive avalanches to which the place was exposed. The wall built for the purpose is still in good order, with the date cut on it, also another wall built in 1830-31.

The history of avalanche destruction at this place is quite full, going back to the year 1518, when 61 persons were killed and many important buildings destroyed.

In the same century, in spite of several snow protections, avalanches came down seven times into the place and destroyed the collective bath houses and hotels. In 1719, 53 persons lost their lives. In 1756, 67, and 93 avalanches again did damage in spite of the then existing walls. The intervals between the avalanches are so great that part of their regular path just above the protection walls is grown up with 15-year-old trees, and some of it with trees 30 years old.

Although no avalanches have come into the village since the 1831 wall was built, so much fear is had of them that further precautions are still contemplated. Those recently undertaken are directed at holding the snow in the avalanche formation places by planting trees, protected while attaining their growth by stakes, as above referred to. These operations have not proved very successful as yet, partly on account of the lofty elevation above sea level (from 5,500 to 6,100 feet) and partly through the destruction of the young growth by cattle.

In the practical carrying out of snow protections the following points are noted: The angles of deflection walls range from 20 degrees to 70 degrees with the axis of the avalanche course. Over 40 degrees does not seem to be good practice. The old walls above the baths of Leuk stand at 40 degrees to 42 degrees. An excavation which is being made to serve as a guide to avalanches has a final direction of 31 degrees, and reaches that by a curve of about 250 ft. radius, beginning tangent to the direct line of the avalanches.

Breast walls are not much recommended, because they are so quickly overtopped by the snow mass. If used the up-hill side should be vertical, otherwise the snow rises and pours over them.

Herr Pollack notes that, in spite of the practical difficulties above referred to in holding the snow *in situ* where it falls, the tendency has been to make use of this method of late years because of the greater cheapness of application. It has been applied near the Arlberg tunnel.

In Switzerland the stakes used for the purpose are about 5 ft. long, those near the Arlberg 6.5 ft. In Switzerland the stakes are set in rows several yards apart up and down the slope, the centre distance of the stakes apart in each horizontal row being about 2 ft. On the Arlberg the stakes are arranged in bands of five rows each, the bands being about 16 ft. clear distance apart. Each horizontal band is made up of five rows of stakes, "staggered," so that the stakes in one row come opposite spaces in the row below. The stakes are about 3-ft. centres each way.

Table of Seconds per Mile at Various Speeds in Mile per Hour.

When traveling by rail it is often convenient to know, when one wishes to determine the speed of the train, just how many seconds are taken to go one mile at any speed in miles per hour. The accompanying table gives the number of seconds required to go one mile at any speed in miles per hour from 1 to 100. In using this table one may take the time required to travel from one mile post to the next, and then look in the table for the speed in miles per hour corresponding to the number of seconds.

TABLE OF SECONDS PER MILE AT GIVEN MILES PER HOUR.

Miles per hour.	Seconds per mile.	Miles per hour.	Seconds per mile.	Miles per hour.	Seconds per mile.
1	3,600	34	106	67	53.7
2	1,800	35	103	68	52.9
3	1,200	36	100	69	52.2
4	900	37	97	70	51.4
5	720	38	95	71	50.7
6	600	39	92	72	50
7	514	40	90	73	49.3
8	450	41	87.8	74	48.7
9	400	42	85.7	75	48
10	360	43	83.7	76	47.4
11	327	44	81.8	77	46 7
12	300	45	80	78	46.2
13	277	46	78.3	79	45.5
14	257	47	76.6	80	45
15	240	48	75	81	44.4
16	225	49	73.5	82	43.9
17	212	50	72	83	43.4
18	200	51	70.5	84	42.9
19	189	52	69.2	85	42 4
20	180	53	67.9	86	41 9
21	171	54	66.7	87	41.4
22	164	55	65.5	88	40.9
23	157	56	64.3	89	40.4
24	150	57	63.2	90	40
25	144	58	62.1	91	39 6
26	138	59	61	92	39.1
27	133	60	60	93	38.7
28	129	61	59	94	38.3
29	124	62	58.1	95	57.9
30	120	63	57.1	96	37.5
31	116	64	56 2	97	37 1
32	113	65	55.4	98	36.7
33	109	66	54.5	99	36.4
				100	36

Almost every one knows the following rule, which gives the result with sufficient accuracy for ordinary purposes: The number of rails passed in 20 seconds equals the number of miles per hour. If all rails were 30 ft. long we should add about 2½ per cent. to the speed in miles per hour as given by this rule, but as there are some short rails the result will be very close without correction. Up to pretty high speeds, say to 60 miles an hour, one can ordinarily count the click of the joints.

Locomotives too Large to Pass the Raton Tunnel.

The new Johnstone compound ten-wheelers for the Mexican Central Railroad, built at the Rhode Island Locomotive Works, met an unexpected obstacle at the entrance of the Raton tunnel on the Santa Fe road. The cabs were too large to pass through the opening, and they have to be removed and other projecting parts taken off, and even then they will but just pass. These are large engines, probably having the greatest width and height of any engines recently built. The butt of the boiler in the cab is unusually large, and more than the ordinary amount of room is given to the fireman. The engines are strikingly handsome, and bid fair to be all that has been expected of them.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We have made some inquiries among rail makers to ascertain somewhat definitely the tendency in rail practice in three particulars—weight of rail, carbon and section. Every one is saying that rails are getting heavier and harder; and it is supposed that the reports of the committee on rails and wheels of the American Society of Civil Engineers have modified the prevailing section. The information that we have been able to gather confirms the first two opinions, but does not indicate much perceptible influence on the section from the committee's report. Specifically, the average weight of section rolled by one mill was 63.5 lbs. in 1890 and 65 lbs. in 1891. Another mill will probably average 70 lbs. this year. In another case the greater part of the rails rolled for the last six months weigh 60, 70, 75, 80, 90 and 95 lbs. per yard. We have no statement of the average weight of rails rolled by this mill in 1890, but the sections cited run up into unusually heavy weights. Another mill reports the average weights of rails above 50 lbs. as follows:

1889	63.75 lbs. per yard.
1890	66.85 " "
1891	66.79 " "

Still another company reports the average of those rails above 50 lbs. per yard as 68.47 lbs. It must be remembered that in recent years the mileage of new road built has been small. This would naturally raise the average weight of rails, for comparatively light sections would be used for long new lines, while the main lines of established traffic are increasing their weights. With regard to the percentage of carbon one company reports a tendency in specifications toward higher carbons, and the tendency of that company, when no specifications are made, is in the same direction. Their usual practice is: for 60-lb. rails, 40 to 45 carbon; 70-lb. rails, 45 to 50 carbon; 80-lb. rails, 45 to 55; and in some cases 50 to 60, with a tendency to an average above 55 carbon. Another mill reports a decided tendency among the more progressive roads to higher carbon rails. The average of that mill is 50 to 60. This is a fair summing up of the practice so far as we can ascertain. One large maker says that the recommendations of the American Society's committee have done some good. There is a tendency among engineers to modify their sections toward the recommendations of the committee, but "much remains to be done in this way still." Another maker says that owing to the depression in the rail trade he has seen no effect from the committee's recommendation. This is quite probable so far as the specific recommendations go as to the details of radii, etc., but there can be no doubt, we think, that the general principle of comparatively light and broad heads has made progress, and that that movement dates back further than the report of the committee.

Week before last we noted a series of tests being made by the Baltimore & Ohio Railroad to determine the actual hauling capacity of the different locomotives in use on that road. This has been done for the purpose of giving the operating department the data for rating its locomotives and designating their loads. The question of the economical and practical load to be taken by a locomotive is a troublesome one, and has been complicated in recent years by the increasing weight of cars. The loads prescribed five years ago, or even three years ago, are no longer possible for a given locomotive. The length of train to be taken out is often settled after more or less of a quarrel between subordinate employés—that is, the enginemen, train conductors and yardmasters, and even when the load has been definitely prescribed in orders from the superintendent, the changing conditions have made it necessary to ignore those orders. So the necessity for a new rating, such as the Baltimore & Ohio has made, becomes apparent. In our issue of Aug. 28, this point was mentioned in connection with the experiments made by one of the great trunk lines, not the Baltimore & Ohio. On a considerable portion of the line mentioned in that article an accurate rating has been established. In Germany this point has been brought out by the motive power departments in an explanation of the reasons for the excessive cost of engine repairs per ton mile. The difficulty there was a little different from that which exists here. The tendency was, and still is, to give the locomotives uniform loads somewhat regardless of the grades, causing the engines to work altogether too hard on heavy inclines, and resulting in excessive repairs which in turn caused the mechanical department to protest against loading engines regardless of a consideration of their most economical hauling capacity.

How to infuse a habit of vigilance into highway crossing tenders is one of the tough problems of the division superintendent. Watchmen at very busy crossings are liable to omit necessary warnings because such a very large proportion of wayfarers look out for themselves, and at less busy places the infrequency of trains tempts the supposed guardian of the public safety, if he be at all lazy, to sit down and shut his mental eyes and ears, if not his physical ones. A recent crossing fatality in Chicago brought out a newspaper statement to the effect that the crossings of the railroad on which it occurred were manned by old and infirm men, who were paid low wages; and in a recent agitation of this topic in Jersey City it was stated that $1.10 was the daily pay of crossing tenders there—a statement which the appearance of the men corroborated. These incidents very clearly indicate one of the remedies that should be applied, but they do not by any means cure the trouble. The New York, New Haven & Hartford and other roads using Hall bells at unwatched crossings have also put bells in the cabins at a good many crossings where there is an attendant, for the purpose of insuring prompt closing of the gates. With a bell that is reliable this affords a valuable aid at crossings outside of yards, for it must be admitted that forgetfulness is an infirmity that very few gatemen are free from; but it is a question whether the plan is not open to the objection that men will depend upon the bell being heard by travelers and neglect to close the gates. When the crossing is unguarded (in the night) teamsters and pedestrians are guided by the bell more or less, and being familiar with bells at other crossings, where they never see an attendant, they will naturally note its indications anywhere; and then if the gateman places dependence upon this he may cause trouble. A man and a girl were killed by a train at Peekskill, N. Y., a few weeks ago in a manner suggestive of this cause. An inexperienced attendant failed to close his gate, and the victims drove upon the track in the face of a train, although the bell was ringing. Incidentally the Hall Company secured a free advertisement in the testimony before the coroner that its bell had never failed to properly operate since it was put in, a year ago, a record which is worthy of note; but if an automatic warning bell is for the benefit of the attendent alone it would perhaps be better to have it small enough to remove all temptation to throw wayfarers upon their own resources. As we have heretofore remarked, a crossing which is attended in the daytime but not in the night ought to be provided with a changeable sign to fit the different conditions, the man displaying, when he goes off, a warning to travelers not to be misled by the open position of the gates or the absence of a flag. Similarly an electric circuit could be connected to a small bell in the cabin during the presence of the watchman and to a large one outside at other times.

Locomotives for Fast Runs.

Last week we gave accounts of three very remarkable runs. The Philadelphia & Reading run was made with one of the class "D" 33 engines with four, 68½-in. driving wheels, the total train load being about 169 tons. The fastest time made was 90½ miles per hour for about one mile, on a level immediately following a descending grade of 37 ft. per mile. The fast run on the New York Central, with a Schenectady engine, was more difficult owing to the long time and distance from start to final stop. In that run 436½ miles was made in an actual running time of 425 min. and 14 sec., giving an average speed excluding stops of 61.56 miles per hour.

The maximum speed between stations on the Central run is unknown. It is said that the fastest mile was made in 47 seconds, or at the rate of 76.6 miles per hour. It is to be regretted that in such cases as this, and the fast run on the Reading, a speed recorder was not used on the engine or one of the cars. An analysis of a diagram made by a recorder on these runs would have permitted an extremely satisfactory investigation to be made of the detail of the velocities and rates of acceleration and retardation. Such a diagram taken in connection with the profile of the road would solve one or two perplexing questions which inevitably arise when reports are made of fast runs. However, this much is certain: A speed of 90 miles an hour has been attained, and the possibility of it is proved beyond question. This will settle once for all the argument of those who have heretofore held that speeds above 70 miles an hour were not only impracticable, but impossible, in spite of the fact that trains run short distances at over 70 miles an hour every day in the year. While there are conditions which would prevent the common adoption of a 90-mile an hour speed, yet it is possible to so improve the permanent way and the coupled locomotive as to make such a speed perfectly feasible.

It will be noted that this fast time was made with locomotives having parallel rods, and as this is essentially a feature of American locomotives, it would appear that our engines are well adapted for high speeds, and we shall not be compelled to resort in the future to single pairs of drivers with the necessary loss of traction. Our locomotives stand to-day as the most powerful in the world, as the most economical under equal conditions, and last, but not least, capable of making the highest maximum and average speed. These two instances of high velocities were not with light train loads; the loads were not equal to our heavy passenger traffic loads, but compared to English and foreign train loads for high speed they are certainly not to be termed "light loads." The New York Central train weighed about 230 tons; the Reading train weighed about 169 tons.

During the past two years we have reviewed at different times some of the necessary changes that must be made in locomotives to adapt them for extremely high speed. Of all of these changes the most important ones are in the counterbalances and reciprocating parts, the steam ports and valve travel, and the arrangement of the exhaust. Radical changes are probably unnecessary, but decided modifications must be made to adapt the average locomotive for fast runs.

It is well understood what will have to be done with the reciprocating parts, and a great improvement is noticeable in the most recent designs. The pistons are now made of less than one-half their former weight, and of cast steel or wrought iron. The reduction in the cross-head is not as great, but a further reduction is at hand. The main rods, which largely affect the counterbalancing, have been reduced one-half in several instances. The parallel rods, which do not affect the accuracy of the counterbalancing, and hence produce no detrimental effect on the track when counterbalanced, have been supposed to be one of the limitations of speed, but the rapid introduction of solid ends and "I" sections, as well as the use of an extremely fine grade of steel having a high tensile strength and great ductility, have so improved the strength, and at the same time decreased the strain by reason of a decrease in weight, that the limit of safety in increasing speed, as determined by side rods, has been raised considerably. If 60 miles an hour was a safe speed with the parallel rods of five years ago, then 90 miles an hour is a safe speed with the most improved form and kind of rod. The reciprocating parts of our best engines to-day, when perfectly balanced, have less detrimental effect upon the roadbed than the best single-driver engines: hence, so far as counterbalancing is concerned, we may consider that the best locomotive designs in this country are such as to remove the limit of speed to a point above the highest practicable speed with permanent way as it is.

The other two necessary changes in design to adapt the present locomotives to high speed have not received the attention they should have. It is only now that we can say that any efforts which promise success have been made to determine what is the proper form of an exhaust pipe and smokestack to give the least back pressure in the cylinders. The Master Mechanics' Association Committee reported this year a few general facts which will assist in a solution of the problem;

but we expect the most conclusive results from the experimental work being carried on by two railroad companies with old engines jacked up in the shop, on which a large variety of exhaust apparatus will be tried. Within another year one will probably know how to construct a locomotive blast apparatus so as to give approximately the least back pressure to the cylinders.

It is the mean effective pressure on the piston at high speeds that must be increased before we can hope to haul heavy trains at a higher rate of speed than is now common. This average pressure on the pistons is to be increased by decreasing the back pressure, as just shown, and further by so increasing the opening of the steam ports at short cut-offs, and prolonging the period of exhaust that the wire drawing at admission and the loss by compression shall be materially reduced. There are those who have proposed, and will continue to propose, radical changes in the valve motion, such as a substitution of a new gear in place of the Stephenson link. While in a general way this is to be encouraged, yet the most advisable and desirable thing to do is to improve the plain "D" valve and the Stephenson link as much as it can be improved before we give it up. This gear we know all about in service. It is reliable and positive, and gives little or no trouble. There is no substitute yet proposed which does not promise trouble from the start when operated at high speed. As we have before shown in the *Railroad Gazette*, there are ways of increasing the port opening at short cut-offs and prolonging the period of exhaust which are perfectly practicable, and are being used with good success on several roads, notably the Reading, where the high speed was made which has called forth these comments. The engine which made this fast time had the following dimensions of ports, outside lap and valve travel: Cylinders, 18½ in. in diameter by 22 in. stroke; steam ports 1¼ in. by 16¾ in.; exhaust ports, 16¾ by 3¼ in.; travel of valve, 7 in.; outside lap, 1¼ in.; inside lap, zero; diameter of drivers, 68½ in.; weight on drivers, 64,400 lbs.; weight on truck, 31,800 lbs.; total weight, 96,200 lbs.

Undoubtedly, the area of port opening was much more than common with this engine at short cutoffs, and was 25 or 30 per cent. greater than with the ordinary engines used on express trains. The indicator cards which we have seen from this class of locomotive have the least compression and the best admission line of any that have been put before us. The engines were built in 1886, and have been operated since that time with perfect success with these foregoing dimensions of valve and valve travel; hence the feasibility of the arrangement is proved beyond question.

Apparatus for Removing Driving Tires Outside of Shops.

It is with considerable satisfaction that one sees the increased interest in devices for removing locomotive driving tires without taking the wheels from under the engines. The advantage, of this we have referred to in the past. It is a possible improvement in methods of repairing locomotives which has been much neglected, and we suppose that what calls attention to it now is the statement so frequently made by master mechanics that the life of driving tires controls to considerable degree the cost of repairs to locomotives. It is often said that when the locomotives are brought into the shop to have the driving tires turned other work is done on them which might have been put off if the engines had not been sent in, so that the cost of repairs during the life of the engine is considerably increased over what it should be by the simple fact that the tires will wear. One might well reply that it is very poor judgment on the part of any master mechanic to permit tire turning to be a signal for a gang of men to jump on the engine and repair everything whether necessary or not; but it must be admitted that there is a strong temptation to put an engine in thorough repair every time she enters the shop and is jacked up. One case occurs to us now in which it has been stated that a set of tires that will wear from ten to twenty per cent. longer is worth double the price to the railroad company of other tires, based upon the fact that the locomotive stays in service longer and the accidental repairs are thus reduced.

It is no great trick to remove locomotive driving tires without removing the wheels from the engine, or without even putting the engine in a round house or repair shop; but some schemes for this are better than others, and it is to get the best method for doing this that several roads are now experimenting. Mr. Hufsmith, of the International & Great Northern, has just devised an ingenious apparatus for doing this and utilizing the air pump on the same engine to increase the heat needed to expand the tire. Mr. John Hickey, Superintendent of Motive Power of the Northern Pacific, has realized the advantage of such an apparatus, and devised one which worked successfully on the Milwaukee, Lake Shore & Western road. The most complete apparatus that has been put on the market for this purpose is that sold by Pedrick & Ayer, the invention of two railroad men, Messrs. J. W. Gentry and G. W. O'Brien. It is used extensively on a number of roads. It was described in the *Railroad Gazette*, May 13, 1887, and Jan. 18, 1888.

Early in the history of the Baltimore & Ohio that company understood the advantage of removing the tires whenever it was necessary to have them turned without taking the engine into the shop just as one would change a main rod, a boiler front, or an engine truck; and to do this they bored the tires and turned the driving wheels on a taper, and secured the tire by means of hooked bolts in such a way that they could be readily removed whenever desired.

One reason, perhaps, for the increased attention to this matter now is the necessity for the reduction of shop expenses; and while it may cost as little to run an engine into the shop, and by means of a drop table or hydraulic lift remove the tires, as to do so while the engine is on a side track, yet the reduction of the incidental repairs undoubtedly makes the second plan the more advisable in a shop where it is impossible to prevent useless work.

August Accidents.

Our record of train accidents in August, given in this number, includes 111 collisions, 110 derailments and two other accidents, a total of 223 accidents, in which 91 persons were killed and 341 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Tot'l.
Trains breaking in two	14	..	..	14
Misplaced switch	4	1	..	5
Failure to give or observe signal.	14	3	7	24
Mistake in giving or understanding orders	..	11	..	11
Miscellaneous	4	8	13	25
Unexplained	15	7	10	32
Total	51	30	30	111

DERAILMENTS:			
Loose or spread rail	7	Misplaced switch	10
Broken bridge	6	Careless running	2
Defective switch	3	Track repairers	1
Defective frog	1	Animals on track	7
Broken wheel	4	Landslide	4
Loose wheel	1	Washout	6
Broken axle	6	Malicious obstruction	5
Broken truck	4	Accidental obstruction	3
Fallen brakebeam	1	Unexplained	38
Broken drawbar	1		110

OTHER ACCIDENTS:	
Broken side rod	1
Various breakages of rolling stock	1
	2
Total number of accidents	223

A general classification shows:

	Collisions.	Derailments.	Other acc'dts.	Total.	P.c.
Defects of road	..	17	..	17	7
Defects of equipment	14	17	2	33	14
Negligence in operating	65	13	..	78	35
Unforeseen obstructions	..	25	..	25	11
Unexplained	32	38	..	70	33
Total	111	110	2	223	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other acc'dts.	Total.
Passenger	50	41	1	92
Freight and other	152	69	2	223
Total	202	110	3	315

The casualties may be divided as follows:

	Collisions.	Derailments.	Other accidents.	Total.
KILLED:				
Employés	19	17	..	36
Passengers	18	24	..	42
Others	7	6	..	13
Total	44	47	..	91
INJURED:				
Employés	104	47	1	152
Passengers	60	125	1	186
Others	1	2	..	3
Total	165	174	2	341

The casualties to passengers and employés, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	1	8	3	5
Defects of equipment	4	21	..	1
Negligence in operating	18	76	19	105
Unforeseen obstructions and maliciousness	19	71	8	19
Unexplained	0	10	6	22
Total	42	186	36	152

Thirty-six accidents caused the death of one or more persons each, and 50 caused injury but not death, leaving 137 (61 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with August of the previous four years shows:

	1891.	1890.	1889.	1888.	1887.
Collisions	111	85	81	88	65
Derailments	110	82	82	121	64
Other accidents	2	11	6	13	8
Total "	223	178	169	222	137
Employés killed	36	65	28	43	45
Others "	55	35	23	13	84
Employés injured	152	196	122	100	89
Others "	189	96	131	102	234
Passenger trains involved	92	66	66	77	51
Average per day:					
Accidents	7.19	5.74	5.45	7.16	4.42
Killed	2.94	3.23	1.64	1.77	4.16
Injured	11.00	9.42	8.16	6.54	10.42
Average per accident:					
Killed	0 408	0.562	0.301	0.248	0.941
Injured	1.529	1.640	1.496	0.914	2.358

Our record of train accidents for July showed more passengers killed than in any month for nearly two years, and the number (54) had been equaled but twice in a single month during the last five years. August, however, comes uncomfortably near equaling July, the total number of passengers killed being 42 and of employés 36. The number of passengers reported killed in the wreck at Statesville, N. C., on the 27th was 18. The verdict of the coroner's jury in this case stated unequivocally that a rail had been maliciously loosened, but the criticisms of the road are not all by irresponsible persons, and good judges who have investigated the reports express doubt about this point. They say that the evidence sustaining it is not specific, and the jurymen themselves have allowed some serious disputes among the members, as to the facts, to get into the newspapers. The State Railroad Commissioners are investigating the case, and we may hope for a clear explanation of it. The disaster next in importance was that at Montezuma, N. Y., on the 5th, where 14 passengers and 2 employés were killed. The cause of this collision, so far as we have been able to learn, was pure negligence, of the grossest kind, on the part of the conductor and brakeman of the freight (and they are under indictment for manslaughter); but the noticeable circumstance about this collision, and about one or two others in August, is that it occurred by reason of the lack of an efficient block system on a road which largely uses that system and therefore must have a full appreciation of its value. The other cases which we refer to are those at West Haven, Conn., on the 4th, and at Branford, on the 10th, both on the New York, New Haven & Hartford. This company has the elements of a good block system on its New York Division, and the sight of the towers along the road doubtless gives intelligent passengers a feeling of confidence. There are now many people who realize, at least in some small degree, that a space interval is better than a time interval for preventing rear collisions, and who therefore naturally notice evidences of the use of the better system; but a point which such people do not know is the importance of having switches properly interlocked and signaled and stations properly equipped with distant signals; this is a feature which the New Haven road lacks, and the lack of it may be regarded as the cause of the West Haven collision. The Branford collision occurred on a single track division, and this is the kind of road where it is customary to postpone the introduction of blocking. But it remains true that with operators on duty at the stations (as they are) a block system is easily feasible where the traffic is not dense; and a foggy morning, when irregular trains are being run close together, is just the time when an absolute block system is needed on any road, even the poorest.

The other deaths of passengers in August were: four at Tell City, Ind. (31st); three at Champlain (5th); one at Webster, Cal. (31st); one at Egg Harbor, N. J. (14th), and one at Campbelltown, Ga. (25th).

At Silver Lake, O., on the 18th a woman passenger, in a train just starting from the station, was hurt by jumping out of the window, which act she committed in consequence of a passenger raising a false alarm that a collision was imminent. The train had broken in two a short time before, and had lost a little time; this seems to have excited the passengers, and when a following freight train approached within about two or three miles the nervous passengers assumed that there was danger of its running into them, although the flagman had gone back and placed torpedoes. At Kane, Pa., on the 19th an engineer was killed by a collision on a lumber railroad, caused by mischievous boys removing the blocks which held a car on a grade.

At Hamilton, Ont., on the night of the 31st, an engine and nine cars of coal ran into an open draw, two men being injured. A locomotive struck a street car in Philadelphia on the 31st, doing slight damage. Fatalities resulting from carriages being struck at grade crossings were quite numerous in August.

The canal at the "Soo" has again broken the record by passing 1,270 craft, registered and unregistered. About 72 per cent. of these were steamers. The registered net tonnage was 1,460,144. This, notwithstanding the very late start of lake navigation this year, brings the traffic at the end of August up to 92 per cent. of that of last year at the same time, and it is expected that in spite of the meagre shipments of iron ore the traffic for this year will equal that of last. The Suez canal has had a remarkable accession to its commerce during the first half of this year; for the six months ending with June 30th last 2,212 steamers of 3,971,492 net tons register passed, compared with 3,389 vessels and 6,890,014 registered tons for the whole of 1890. If the traffic of the Suez canal continues at the present rate throughout the year it will be very nearly as large as the traffic through the Soo canal. It is interesting to note, in relation to the objections made to canals with locks, that 828 lockages were made at the lock on the Soo canal during the month of August; this was rather more than one per hour for that period.

A number of railroad officers can breath easier since the arrest and imprisonment of Amie Barraud, the Frenchman who derailed a Lehigh Valley locomotive by the use of dynamite on the night of Sept. 9, as he has confessed that he perpetrated the similar crimes on the New York, New Haven & Hartford near Windsor, Conn., July 1, and on the West Shore at Little Ferry, N. J., in May. He has been in prison most of the time for 15 or 20 years, having committed other atrocious crimes. It would seem that some one made a big blunder in letting him go free.

The Baltimore & Ohio now operates about 200 miles of its line under the block system. The system begins at Philadelphia, the trains over the Philadelphia Division being among the fastest run by the company, and in the world for that matter. The use of the system is being extended at the rate of about 30 miles a month.

NEW PUBLICATIONS.

Poor's Directory of Railway Officials and Manual of American Street Railroads. New York: H. V. & H. W. Poor. 1891. $2.

Of the accuracy of this Directory we cannot yet speak—that is a matter that can only be decided by use—but it is certainly comprehensive and well arranged. The first and most important list, covering 149 pages, is an alphabetical table of railroads, with their officers. This is followed by special lists of various departments, that is, managers, chief engineers, car builders, etc. There is a list of street railroads, another one of city and suburban tramways, one of private railroads, and still another of the railroads of Mexico, Central and South America. The book contains still other lists, and closes with railroads projected and under construction, classified by states.

Technology Quarterly.—Massachusetts Institute of Technology. Boston; April, 1891.

The contents of this issue are: Aluminum, by A. E. Hunt; The Color of Soils in High and Low Latitude, by W. O. Crosby; Irrigation in Arizona, by F. H. Newell; The Beginnings of Science, by G. L. Calkins; The Purification of Water by Metallic Iron, by E. Devonshire, and One Month's Work on Two Plane Tables, by R. H. Rogers. There is also a paper on Church Dissensions on the Slavery Question, by Benton Sturgis, which is probably important, but does not seem to have a strictly logical place in a technical quarterly.

Journal of the Franklin Institute. September, 1891.

The first paper is a report of the Committee on the Sciences and the Arts on the Wootten locomotive, which closes with the recommendation that the John Scott legacy premium and medal be awarded to Mr. John E. Wootten for the design of this locomotive. Further papers are on the Inertia of Connecting-rods and Couplers by Prof. J. F. Klein; Conflagrations in Cities, by C. J. H. Woodbury; New Alloys and their Engineering Applications, by F. Lynwood Garrison, and Eyesight, its Care During Infancy and Youth, by Dr. L. W. Fox.

American Railway Master Mechanics' Association; Report of the 24th Convention. Angus Sinclair, Secretary, 140 Nassau street, New York.

Mr. Sinclair has issued his report of the 1891 Convention with his usual promptness. It contains the full report of the Convention, also the standards of the Association, list of members, constitution, etc., and has a good alphabetical index.

Journal of the New England Water-Works Association, September, 1891. Secretary, R. C. P. Coggeshall, New Bedford, Mass.

This issue contains the full report of the Hartford convention of the Association, held last June, with papers, discussions, roll of members, etc.

TRADE CATALOGUES.

Illustrated Catalogue New York Air Brake Co., New York, 1891. This catalogue is issued for the purpose of furnishing a complete description of the New York quick action automatic air brake. It shows in detail the various apparatus manufactured by this company, and full schedules of the different equipments are given. The whole is excellently illustrated.

The Johnstone Compound at Chicago.

Engine No. 146 of the Mexican Central Railway, on its way from the Rhode Island locomotive works to Mexico, was shown to the members of the Western Railway Club at its last meeting. This engine is one of six which have been made after designs by Mr. F. W. Johnstone, Superintendent Motive Power, drawings of which were given in the *Railroad Gazette* of June 5, 1891. They have two high pressure cylinders within two low pressure cylinders, with annular pistons having two sets of packing rings, inner and outer. The high pressure cylinder is 14 in. and the low pressure 29½ in. diameter, there being a 1⅝-in. shell or wall around the former. All cylinders have 24-in. stroke. The main (high pressure) valve is in the form of a box and sits over the low pressure valve, the former having ⅞ in. outside lap, while the latter has $^{7}/_{16}$ in. outside lap, neither having any inside lap. When both valves are central and the valve stem started, the high pressure valve will move $^{7}/_{16}$ in. before the low pressure valve moves at all, there being ⅞ in. play between the two, with two coil springs at each end of the inner valve to absorb the shock. Thus while running, the high pressure valve, after reversing its motion, always moves ⅞ in. before the inside valve starts. Below is given a table showing the variation in the cut-offs for the two cylinders:

Cut-off.		Compression begins.		Exhaust.	
H. P.	L. P.	H. P.	L. P.	H. P.	L. P.
12⅛	19⅛	19⅛	22	23¾	22
14	20	20	22	23¾	22
15	21	21	22	23¾	22
17	21	21	23	23¾	23
18	22	22	23	23¾	23
19	22	22	23	23¾	23⅛
20¾	23	23	23¾	23¾	23¾

The starting valve by which live steam may be let into the low pressure cylinder consists of a small piston valve set into the balance plate over the main valve.

On Wednesday morning, the next day after the Club meeting, a small party of railroad men started out on this engine to the freight yard of the Wabash road, where they coupled to twenty-four loads of steel rails and merchandise, and went down the line. At the several stops made during the thirty-five-mile run the engine started without the least hitch, picking up the train evenly and smoothly. Thursday noon Mr. Johnstone and party (including several officials from the Wabash and Illinois Central roads) started from the yard with thirty loads, mostly rails, and two way cars for St. Louis. The performance of the previous day was repeated in that the starting was done without any hindrance, or assistance from the slack. A rough estimate was made by one of the party by counting every shovelful of coal going through the firebox door and measuring the water in the tank before and after with a pole, and by computing the shovelfuls and checking the weight by the number of tons taken on at the chute and the amount left in the tank, which showed that the evaporation amounted to about, or a little over, eight pounds of water per pound of coal.

This saving is largely due to the more perfect burning of the gases in the combustion chamber, which extends for 2 ft. back from the front end of the firebox. The brick arch is built up straight from an I-beam placed across the mud ring, and is crowned in both directions, laterally and longitudinally.

One of the features in the construction of these engines is the use of three-part brasses designed by Mr. Johnstone, which distribute the pressure on the bearing over a greater area, thus lessening the weight in pounds per square inch. The bearing is taken on three narrow strips instead of one wide strip. These brasses were illustrated in the *Railroad Gazette* several months ago.

The cabs on these engines are of iron (a standard for this road), and are extremely broad and high, and will not pass through some of the tunnels *en route*, in fact, much care has to be exercised in running along through ordinary yards. The steam valves on this engine work evenly and smoothly, producing but a very slight sound when working hard, to one sitting on the pilot and listening with the ear close to the steam chest. The exhaust is, as would be expected, simply a suppressed puff. In this connection it might be stated that these engines are supplied with mufflers for the safety valves.

On account of the propensity of "Greasers" for thieving it is found necessary to fasten down everything which can be considered as removable. As an instance, the signal flags have their masts fitted to brass ⊥-shaped ends, which are pivoted on rivets to a small box casting just below the taper stack. By lifting off a light hood either mast may be tipped out at an angle of about 45 degrees. With the signal lights the oil wells are cast into the holder and fastened to the boiler, the only movable part being the cast iron box into which the four semaphore glasses are set. This engine received much attention at Chicago.

The Statesville Disaster.

The disastrous wreck at Third Creek, near Statesville, N. C., on the Richmond & Danville, August 27 (reported in the *Railroad Gazette* of Sept. 4), has not yet been satisfactorily explained. The preponderance of evidence is in favor of the theory that a rail was removed by tramps, but there seems to be not the slightest clue to the perpetrators. The jurors' report gave no details and the State Railroad Commissioners have not yet published their report. But the officers of the road have been active, and we give herewith the substance of two reports made to them by officers of other roads, tending strongly to show that the train was thrown from the track by a loose or missing rail, which had been loosened or taken out purposely.

Immediately after the disaster, the officers of the Richmond & Danville, to meet the probable public demand for an impartial investigation, asked well known officers of the Pennsylvania and the Baltimore & Ohio roads to visit the bridge and make a careful examination; this was done, and the result is presented below. These reports do not tell all the particulars and they cannot be called exhaustive, but they give strong testimony to the general good condition of the road and thus support the claim of the Richmond & Danville to have taken good care of this portion of its line.

Col. H. T. Douglas, Chief Engineer of the Baltimore & Ohio, says:

The viaduct is located about two miles west of Statesville, and consists of five arches built of stone and brick; it is on a straight line, the tangent beginning more than a half mile east of the same and extending across or west of the viaduct. The train to which the accident occurred was west bound, and, therefore, moving on a straight line. The floor on the viaduct having been partially carried away, I can only describe it from an examination made of a similar structure located a few miles west of this point, the floor of which, I was informed, was similar in all respects and laid at the same time (about three years ago). This last I found as follows:

First, there were laid transversely on the masonry at intervals of 7½ ft. 4x12-in. sills; on these and notched into the same were two 10x12-in. stringers, all of heart yellow pine. Upon these stringers were laid the cross-ties notched 1 in. over the stringers, and upon the ties the rails, all in good condition. There were two 8x8-in. heart yellow pine guard rails outside of the rails, notched 1 in. over the ties and bolted at each fourth tie. The sills and stringers remained on the Third Creek viaduct, with the exception of one piece of stringer on the north side at the east end of the structure, and were found to be sound in all respects. The floor system was a good one, equal to floor systems on similar structures on other first class roads.

The derailment occurred, as shown by the marks of the wheels on the ties, which were in the track east of the viaduct at the time I made my examination, at a joint 60 ft. east of the east end of the viaduct and on the north side of the track.

[The marks, as shown by a photograph, are in such a position that they must have been made after the rail was removed. The track being restored after the accident, and the first displaced rail being again taken out, the path of the flanges, beginning on the inner side at the end of the last undisturbed rail, runs diagonally through the rail seats on the several ties, and comes out just outside of the next rail. It is believed that if the rail had been crowded out by the wheel which was first derailed, the marks could not have been so regular.]

. . . The ties were found to be sound, well bedded in gravel ballast and spaced 16 ties to a 30-ft. rail.

I also made an examination of the roadway and structures from Hot Springs to Salisbury, a distance of 180 miles. The roadbed was found to be of standard width and well drained; the ties sound, and of more than standard dimensions, and laid 2,786 to the mile; the rail, 60-lb. steel, with a good and strong joint in perfect condition, and well spiked. A large part of the road is ballasted with broken stone, and the remainder with gravel and sand; the track is in good surface and line, the structures, generally of iron, stone and brick, in good condition, and the general condition of the roadbed, track and structures up to the standard of first class roads. Under these circumstances my conclusions are as follows:

That the accident was caused by the removal of a rail from the track; that this rail was located on the north side of the track 60 ft. east of the east end of the viaduct, which removal derailed the train; that the momentum of the train carried the locomotive and cars forward a distance of about 160 ft., crushing and breaking the ties and guard timber until they reached a point at which the centre of gravity was outside of the walls of the viaduct, when the train toppled over and was dashed into the creek-bed below. This is supported by these reasons: First, the rail referred to was found on the road-bed detached, showing no marks of wheel flanges, or evidence of having been violently wrenched from its place, such as broken splice bars, or bolts or bolt holes. Second, the location of wheel marks on the cross ties is such that they could not have occurred with the rail in place, and, third, the condition of the ties left in track, and of the roadbed at the point the accident occurred, coupled with the general condition of the rails, spiking, surfacing and line of the track, is such that the theory of the spreading of the rails is untenable. . . .

Mr. D. H. Lovell, Superintendent of the Bedford division of the Pennsylvania, makes a report agreeing in substance with the above. He says, in part:

The marks upon the crossties indicate that the accident was caused by one of the rails having been removed from the track purposely. There is nothing whatever to indicate that it was caused by the track spreading, the condition of the track being such as to preclude it, the crossties being well spiked and sound. The bridge floor was of modern construction, and all the timber also perfectly sound. After a careful inspection of the entire Western North Carolina Railroad, I regard its physical condition as excellent, the crossties and rails being more than ordinarily good, the track apparently having been renewed within the last three or four years.

A Short Review of the History of the Articulated Locomotive.

In a communication in the *Zeitung des Vereins Deutscher Eisenbahn-Verwaltungen*, issue of February, 1891, Herr A. Brunner relates the early history of the articulated locomotive. He uses the terms "double" and "complex" locomotives, and includes those whose mechanism is arranged in two separate groups running one behind the other, and lying under a boiler common to both. A distinction is made between such as have only one or both of the motor trucks made to swivel, and whether compound or simple.

Articulated locomotives generally carry their own fuel and water; that is, have no separate tender, for the reason that owing to the greater number of axles and the longer wheel base, there is no danger of overloading the axles. Nearly all articulated locomotives since 1887 have one fixed and one swivel motor truck, with the engine constructed according to Mallet's compound principle. The four-cylinder locomotives with two groups of axles, three in each group, weighing about 60 tons each, built in 1880 for the northern railroads of France upon the Petiet principle, are not given in the following list, because the axles were all situated in one frame; therefore, the machine did not have the characteristic feature of articulated locomotives—namely, the free movement on curves.

W. W. Evans, Mem. Am. Soc. C. E., in a paper on "Railway Gauges," wrote in 1873 of an ancestor of the articulated locomotive designed by W. Chapman and used in 1812 on a coal railroad in the county of Durham, England. This oldest forerunner of articulated loco-

motives is described in Luke Herbert's Encyclopedia, London, 1886. According to W. W. Evans and Zerah Colburn, the first trial worth mentioning of articulated locomotives was made in America in 1832 for the South Carolina Railroad. Horatio Allen in New York early designed a light locomotive with two swivel motor trucks in order to use greater weight on the extremely light strap rails which were in use at that time. Later, William Norris, of Philadelphia, U. S. A., erected a branch manufactory in Vienna, and through these works many peculiarities of American locomotive construction became known to the Austrians and were adopted by them. Strictly, then, according to history, the articulated locomotive would be an American invention.

The chronological progress of the respective locomotives from the earliest authentic date up to the present time is as follows:

1832.—Horatio Allen constructed in New York in 1832 four articulated locomotives for the South Carolina Railroad. These engines had two swivel trucks, each with a driving axle and a running axle. The two driving axles were the middle two of the four axles, and each of the two swivel trucks was supplied with only one steam cylinder, which acted upon the driving axle. (*Engineering*, London, Feb. 2, 1886, and *Railroad Gazette*, March 4, 1871.)

1850.—Wilhelm Guenther in Vienna-New City (now joint stock company of the locomotive works, formerly Georg Sigl in Vienna-New City), and the Société John Cockerill in Seraing, Belgium, built for the Semmering locomotive prize contest of 1851 four-axled articulated locomotives with two swivel motor trucks. The locomotive from Seraing had a double boiler with central fire box, and the holder of the patent of the Cockerill construction was the former head machinist Lausmann, of the Bergisch-Maerkischen Railroad. (Alphons Petzholdt, "Die Lokomotive der Gegenwart," page 99, Braunschweig, Friedrich Vieweg & Son, 1875.)

1860.—Eugène Flachat in Paris projected in this year six-axle articulated locomotives of 60 tons, service weight for crossing the Alps. (Eugéne Flachat, "De la Traversée des Alpes par un Chemin de Fer," Paris, Lacroix, 1860.)

1862.—Jean Jacques Meyer, of Muelhausen, exhibited at the World's Fair in London, 1862, the plans of a six-axle articulated locomotive with simple boiler of 60 tons service weight. The General Director at that time of the Austrian Railroads, J. Maniel, created the public interest which led to a study of this system. ("La Propagation industrielle," Paris, Edouard Blot, 1868.)

1863.—Charles Thouvenot, in Bex, Switzerland, proposed for the Simplon crossing a six-axle articulated locomotive of 83 tons service weight, with a steam boiler with 243 sq. metres heating surface and 4 sq. metres grate surface. (Charles Thouvenot, "Un moyen de franchir les Alpes par un Chemin de Fer," Vevey, Gschwind and Suter, 1863.)

1865.—Robert Francis Fairlie in London. The first articulated locomotive after Fairlie's patent was erected in the year 1865 by James Cross & Co., in St. Helen's, for the Neath & Brecon Railroad in Wales. The engine "Progress" was arranged with two four-wheeled motor trucks and with one double boiler, and had, including two tons of supplies, a service weight of 42 tons. Since that time there have been several hundred Fairlie engines built by English and American locomotive works for the most widely different conditions of service and width of tracks. The smallest of these engines for the 2-ft. Festiniog railroad, in Wales, weighed 20 tons, while the largest Fairlie engines running in Mexico have a total weight of 92 tons, and are, therefore, the largest locomotives on earth. Recently the Decauville Works in Petit-Bourg and the Cail Works in Paris have accepted this system of engines for the portable French military railroads of 60 centimetres width of track—12-ton engines.

1867.—George Thomas Lommel, in St. Gallen, designed for the crossing by rail of the Lukmanier, articulated locomotives of 75 tons weight, with middle rail mechanism, after the system Fell-Thouvenot. ("Projekt einer Schweizerischen Alpenbahn ueber den Lukmanier," St. Gallen, Zollikoferische Offizin, 1867.) In the same year there were plans to be seen at the Paris World's Exposition of articulated locomotives after the Meyer and Thouvenot systems.

1868.—Parent, Schacken & Co. (J. F. Cail), in Fives-Lille, built this year the first articulated locomotive after the system Meyer "L'Avenir," which had two four-wheeled motor trucks and a service weight of 50 tons. (*Engineering*, London, March 19, 1869).

1870. Adolph Brunner, in Seraing, constructed for the Société John Cockerill a six-axle articulated locomotive with single boiler and combustion chamber of 60 tons service weight for mountain roads. ("Locomotive de Montagne," Liége, Desoer, 1870, and *Engineering*, London, Oct. 28, 1870).

1873.—La Compagnie Belge pour la Construction de Matériel de Chemins de Fer in Brussels, exhibited at the World's Fair in Vienna in 1873 a six-axled articulated locomotive after the Meyer system. This engine, built for the Grand Central Belgian Railroad, was constructed upon the plans of Jean Jacques Meyer and Adolphe Meyer Fils in Paris, and had a service weight of 72 tons. (*Engineering*, London, July 11, 1873.)

1876.—Adolf Brunner, in Berne, projected for a temporary narrow gauge Simplon rail crossing omnibus locomotives with two motor trucks. (*Schweizerische Handels-Zeitung*, page 7. Zureich, 1876.) In the same year Brunner's steam omnibus came into use upon the railroad between Lausanne and Echallens, with one motor truck and one running truck. (Huesinger von Waldegg's Musterkonstruktionen fuer Eisenbahnbetrieb," Wiesbaden, C. W. Kridel's publication. 1877.)

1877.—Charles Brown, in Winterthur, designed for the Gothard Railroad articulated locomotives after the Fairlie system, with two three-axle motor trucks, of 60 tons service weight. (*Schweizerische Handels-Zeitung*, page 668. Zuerich, 1877.)

1878.—Fritz Rimrott, in Halerstadt, constructed a six-axled articulated locomotive of 60 tons service weight, with fixed front truck and movable rear truck, resembling the Engerth arrangement. (*Zeitung des Vereins*, page 144. 1889.)

1884.—Anatole Mallet in Paris took out the first French patent upon a compound, articulated tender locomotive upon which the rear high pressure machine is fixed and the front low pressure machine is movable. The principle of these four cylinder compound engines was sketched by Mallet in January, 1877, in a speech before the Société des Ingénieurs civils in Paris. (A. Mallet, "Etude sur l'utilisation de la vapeur dans les locomotives et l'application à ces machines du fonctionnement compound," Paris, E. Caplomont et V. Renault, 1878.)

1885.—Richard Helmholtz in Munich constructed a four-axled one metre gauge compound articulated tender locomotive with a service weight of 37 tons, with the same arrangement of the motor groups as Mallet's and with receiver conduit through the boiler. (*Zeitung des Vereins*, page 114, 1889.)

1887.—La Société métallurgique in Brussels and Tubize built for Décauville in Petit-Bourg the first compound articulated tender locomotive after Mallet's system. The four-axled engine "L'Avenir," built for 60-centimetre gauge, has a total weight of 12 tons and ran at first during the agricultural exposition in Laon upon grades of 70 per cent. and upon curves of 27 metres diameter. (*Schweizerisches Bauzeitung*, page 83, Zuereich, 1890.)

Richard Herbert Lapage, of London, took out in the same year the English patent for compound articulated locomotives, by which the low pressure machine lies in a front swivel truck. ("Improvements in Compound Locomotive Engines," London, patent office, 1888.)

1888.—La Société Décauville in Petit-Bourg began the erection of articulated locomotives after the Fairlie and Mallet systems, which were destined for the portable French military railroads of 60 centimetres gauge. Similar machines were built for the Paris Exposition railroad in 1889, while the locomotive works in Belfort and Cail in Paris supplied articulated locomotives for the French secondary roads. (A. Malleté "Développement de l'Application du Système compound aux Machines locomotives," Paris, Chaix, 1890.)

1889.—The locomotive works Krauss & Co. in Munich made for portable military railroads a six-axle articulated locomotive with simple boiler, of 14 tons service weight and of 60 centimetres gauge. Upon this locomotive the four cylinders are firmly placed upon a through main frame and the transmission of power to the swivel truck is made by means of cog wheels. (*Zeitung des Vereins*, page 343, 1889.)

Anatole Mallet in Paris patented in the same year a combination adhesion and cog wheels compound articulated locomotive, whereby the driving cog wheel was put in the low pressure engine.

Fritz Rimrott in Halberstadt constructed a four-axled compound articulated tender locomotive for mixed service of 52 tons service weight. (*Glaser's Annalen*, Berlin, July 1, 1889.)

La Société de Marcinelle et Couillet in Couillet, near Charleroi, built for the Spanish secondary railroads with a one-metre gauge, four-axle compound articulated tender locomotives after the Mallet system of 24 ton service weight. (*Bulletin du Congrès international des Chemins de Fer*, Paris, 1889.)

1890.—J. A. Maffei in Munich built a six-axle compound articulated tender locomotive after the Mallet system, of 84 tons total weight, for the Gothard Railroad, Europe's greatest locomotive, which was delivered in January, 1891. (*Zeitung des Vereins*, page 71, 1891.)

The Saxon machine factory, formerly R. Hartmann, in Chemnitz, built for the line Schwarzenberg-Annaberg of the Saxon railroads, two four axle compound articulated tender locomotives with 50 tons service weight after the Meyer-Mallet system. (*Zeitung des Vereins*, page 881, 1889.)

Adolf Brunner, in Munich, constructed a four-axled compound articulated tender locomotive with a total weight of 60 tons, after the Mallet system for ordinary and express train service, which is supplied with a switch attachment, so that as occasion demands one may use only one motor group; that is, may run with the high pressure engines only. (*Zeitung des Vereins*, page 444. 1890, and *Zeitschrift des Vereins Deutscher Ingenieure*, page 708, 1890.)

Fritz Rimrott in Halberstadt, constructed compound articulated tender locomotives for different conditions of service and gauges, with a service weight of from 29 to 62 tons, in which, as in the Mallet designs, the front low-pressure machine is made movable. (*Glaser's Annalen*, Berlin, page 141, 1879, and *Zeitung des Vereins*, p. 43. 1891.)

Les Anciens Etablissements J. F. Cail, in Paris, provided for the standard gauge Hérault secondary railroad, four-axle compound articulated tender locomotives with a service weight of 35 tons after the Mallet system. ("Mémoires de la Société des Ingénieurs civils," Paris, July, 1890.)

The Swiss locomotive and engine factory in Winterthur constructed one-metre gauge four-axle compound articulated tender locomotives with a service weight of 40 tons. (*Zeitung des Vereins*, page 14, 1891.)

1891.—J. A. Maffei, in Munich, built six four-axle compound articulated tender locomotives after the Mallet system, with a service weight of 58 tons, for the Hauenstein service of the Swiss Central Railroad; also two four-axle engines after the same system, with a service weight of 40 tons for the one-metre gauge railroad from Landquart to Davos. (*Zeitung des Vereins*, page 243, 1891.)

TECHNICAL.

Manufacturing and Business.

The Buffalo Drop Forge Co. has been chartered in New York to manufacture drop forgings, tools and machinery. The capital is $40,000, and the directors are Samuel C. Rogers, Geo. D. Barr, Robert T. Walker and others.

The Peckham Street Car Wheel & Axle Co., recently reorganized as the Peckham Motor Truck & Wheel Co., has doubled the capacity of its plant at Kingston, N. Y., and expects to have facilities during the coming year for manufacturing at least 500 trucks.

Work on a hammer shop, a producer-house and a boiler-house to be added to the Boies Steel Car Wheel Co.'s work at Scranton has been begun.

The Columbia Supply Co., of Chicago, has been chartered to manufacture railroad supplies by C. D. Leach, C. A. Cox and John Francis.

The plant of the Milwaukee Bridge & Iron Works, at Milwaukee, Wis., has been purchased at assignee's sale by Julius G. Wagner, for $30,000. Mr. Wagner has been engaged in the manufacture of architectural iron work and will continue the manufacture of bridges.

Mr. E. R. Merrill, formerly Superintendent of Transportation of the Burton Stock Car Co., has been appointed General Agent for the Hinson Car Coupler Co.

A. J. Farley, who has been connected with the Q. & C. Co., has been elected Secretary of the National Hollow Brake Beam Co., with offices at the Phenix Building, Chicago.

Mr. A. T. Shoemaker, for several years connected with the Troy Steel & Iron Co. and the Illinois Steel Co. has opened an office in the Rookery Building, Chicago, and at 146 Broadway, New York City, as a dealer in railroad supplies and equipment.

The Central Construction & Equipment Co., of Chicago, with capital stock of $200,000, has been chartered in Illinois by Roswell Shinn, J. R. Parker, J. E. Cailey and Thornton Hall; and also the Acme Railway Signal & Mfg. Co., of Chicago, by W. H. Miller, J. G. Bohl and Emil Lange.

Mr. Jacob Neville, of Middleburg, N. Y., one of the organizers and the first Vice-President of the Middleburg & Schoharie Railroad, died at Middleburg, Sept. 19, in his 63d year.

Mr. M. W. Elliott, Acting Superintendent of Motive Power and Machinery of the Texas & Pacific, and formerly Master Mechanic at Marshall, has resigned and has been succeeded by Mr. A. S. Douglas, Master Mechanic at Big Springs, Tex. Mr. Elliott has been Acting Superintendent of Motive Power since September, 1889, when he succeeded the late H. N. Burford.

The Leland Car Heater & Steam Coupler Co. has received a second order for equipping cars on the New York, New Haven & Hartford with the Leland heaters. This second order is for equipment on 11 cars, and the first order given only a few weeks ago was for equipping 50 cars.

A Pintsch gas plant is about completed at Omaha, and will soon be used to charge all the passenger cars running on the Chicago, St. Paul, Minneapolis & Omaha, between Minneapolis and Duluth, and Kansas City, Sioux City and Omaha. Some of the cars of the through trains are now using Pintsch gas, being charged from the plant erected for the Chicago & Northwestern at Chicago.

Iron and Steel.

The rail mill at the steel works at Pueblo, Col., made a test run last week preparatory to starting the mill on a long run. All the machinery and converters have been recently repaired and the works are now in good order.

The entire equipment of the Worcester Steel Works, Worcester, Mass., is offered at private sale by the assignees. A complete catalogue of the property has been issued by Winslow L. Horne, 6 Oliver street, Boston, Mass.

The Lukens Iron & Steel Co., of Coatesville, Pa., will erect an open hearth steel plant, consisting of two 15-ton acid open hearth furnaces of the standard Siemens type, for the manufacture of ingots for their plate mills, and expect to have the plant in operation in about six months.

The plant of the American Tube & Iron Co., manufacturers of wrought iron welded tubes, at Middletown, Pa., is being improved and practically reconstructed. Fuel gas is being introduced to take the place of coal and coke.

The annual meeting of the stockholders of the Thomas Iron Co. was held at Hokendauqua, Pa., last week. The following officers were re-elected: B. G. Clarke, President; Samuel Drake, Vice-President; J. T. Knight, Secretary and Treasurer. A Board of Directors was also elected, including Benjamin G. Clarke, Samuel Drake, J. T. Knight, Samuel Thomas, Charles Stewart, J. W. Fuller and W. W. Marsh.

The Pittsburgh Steel Casting Co. has just turned out a large Bessemer steel rim which measures 15 ft. in diameter, and weighing in the rough 24,000 lbs. The rim is intended for the driving wheel of the engine now being built by the Robinson-Rea Mfg. Co. for the new tin plate mills at Demmler, Pa.

The Pittsburgh Iron & Steel Engineering Co., Pittsburgh, Pa., has received a contract from the Shenango Valley Steel Co. for the erection of a new Bessemer plant at New Castle, Pa. The equipment will consist of two 7-ton Bessemer converters with three cupolas and blooming mill. There will be a pair of 42 × 60-in. engines, duplicates of those recently placed in the new steel plant at Sparrows Point, Md. Also two blowing engines, 12 tubular boilers and two soaking pit furnaces. The new plant will have a capacity of 700 tons of billets per day, and will probably be completed by July, 1892.

The new Bessemer plant built for the Ashland Steel Co., at Ashland, Ky., by the Pittsburgh Iron & Steel Engineering Co. is now completed. The plant has a capacity of about 400 tons per day. The Bessemer pig iron used in the plant will be made by the blast furnaces of the Norton Iron Works and the Belfont Iron Works Co., and these two firms will probably consume two-thirds of the output.

The Rail Market.

Steel Rails.—Pittsburgh rail mills continue to quote $30 f. o. b. at mill; and New York $30.75@$31 at tidewater.

Old Rails.—Old steel rails may be quoted at Pittsburgh at $17@$17.50. A sale of 700 tons of old iron rails for delivery in the Mahoning Valley was made at $23.75. Chicago's old iron rail market appears weaker, at $23.25; old steel rails are nominally worth $15@$16.

Compound Locomotives.

The Chicago & Grand Trunk is building a compound locomotive at its own shops from designs of Mr. Roberts, Mechanical Superintendent. The cylinders and special apparatus peculiar to the compound locomotive will be of the Vauclain four-cylinder type, and will be furnished by the Baldwin Locomotive Works.

The Channel Tubular Railroad.

At the meeting of the British Association in Cardiff last month Sir Edward Reed presented a paper describing a proposition for constructing a railroad across the British Channel. It is, in brief, to lay tubes of steel or iron and cement concrete on the bottom of the sea. He showed that in no place on the line selected does the depth of water exceed 200 ft. and several miles out from the English coast it is less than 100 ft. deep. The grade would not necessarily exceed 1 in 40. The tubes could be towed out and sunk, and the method of laying them has been very carefully elaborated, "each length of tube as laid being made the instrument and means of bringing the next length into its position with unerring accuracy." The two lines of tubes will be connected and probably will be 50 ft. apart. They will be approximately 20 ft. in diameter and each section 300 ft. long. The cost is estimated as between £12,000,000 and £15,000,000. One point made by Sir Edward is that the tubes could be

easily destroyed in case of war. In the discussion which followed, Mr. J. H. Greathead held that a tunnel could be made through the chalk for one-quarter the estimated cost of this tube railroad, and he thought the money would never be subscribed for such a scheme. He doubted if it would be possible to ventilate a tube 20 miles long.

Sir Benjamin Baker said that the cost would be prohibitory. The cost of a channel bridge as proposed by Messrs. Schneider and Hersent would be £35,000,000, and he was of opinion that that bridge would never be built. He did not consider the channel tubular railroad a physical impossibility, but financially it is so.

New Stations and Shops.

The contract for the erection of a freighthouse at New Hope, Pa., which is to be of brick, 60 × 34 ft., with an 8-ft. platform, has been awarded to Alexander Martin, of Conshohocken, Pa.

The Goshen Car & Railway Equipment Co., which proposes to erect car works at Goshen, Va., has been reorganized, with G. W. Talbott as President, and G. H. Fitzwilson, Vice-President.

The Great Northern will soon let the contracts for building new shops at Great Falls, Mont., on the west side of the Missouri River. The company has requested bids for the construction of a machine shop, blacksmith shop and boiler shop, to be 140 ft. × 150 ft.; a storehouse and office to be 40 × 100 ft. and a 20-stall brick roundhouse. These are to be brick buildings about 23 ft. high of the usual shop pattern.

The Noonan Track.

In our issue of Sept. 11 appeared a paper on Mr. Noonan's system of laying railroad track. All that Mr. Gleaves says in that paper is confirmed by Mr. J. W. Goodwin, Chief Engineer of the Lynchburg & Durham. He says that for over two years the track has had comparatively no work done on it, as to line and surface, both of which remain practically perfect. During this month the cuts on this section of the road have been ditched for the first time since the track was laid. Mr. Goodwin will be glad to show this track to any engineer who will take the trouble to look at it.

The Multiple Speed Railroad.

The Multiple Dispatch Railroad to be constructed at the World's Fair Grounds at Jackson Park, Chicago, is well under way. It is expected that the trestle work will be completed by the last of this month. The wooden bents are composed of 8-in. × 8-in. timbers laid in the usual manner for trestles. As almost the entire road is one continuous curve, with a very small radius at the extremities, we may look for some interesting construction in the different bents.

Car Heating.

The Consolidated Car Heating Co., of Albany, reports its shops in Canada and the United States running full force. Since June 1 the company has received orders for 384 car equipments, 56 locomotive equipments and 6,152 steam couplers. The Vanderbilt and connecting lines are putting the Sewell steam coupler on all cars and locomotives.

The Cyclone Snow Plow and the Vulcan Iron Works.

The suit of the Vulcan Iron Works against the Cyclone Snow Plow Company, which was tried before the United States Circuit Court in Minneapolis last week was decided in favor of the Vulcan Iron Works. The suit was brought to recover a bill for construction amounting to about $8,666 and interest. The decision of the United States judge in this case is an interesting one, as it involves the relationship of builder and purchaser under a contract. The contract stated that the Vulcan Iron Works were not to be responsible for material purchased from outside parties or for the operation of the machine when completed, and only for material and workmanship of that portion of the machine which they produced. The contract also provided that a representative of the Cyclone Snow Plow Company should pass upon all designs and workmanship. The claim was set up by the defendant that owing to the fact that its representative was not a mechanical engineer, and that the designs were made by the plaintiff, the builders were liable for the operation of the machine; but the judge held that there was no liability on the part of the plaintiff for an experimental machine, as it was stipulated that all designs and material were to be satisfactory to defendant's representative at the time of construction, and it was shown that the said representative was present during construction. He also held that as the Cyclone Snow Plow Co. had replevined the plow and taken it out of the state, and taken oath that its value was $10,000, the company could at least be held for that amount. The verdict was for $9,522. The history of this machine is a peculiar one. It has been shown to work well under certain conditions, and has been sold to the Southern Pacific Company. It is stated that the price paid was $16,000 for the plow, and the right to construct such plows for the entire system of the road.

Car Couplers.

The Van Dorston Cushioned Carrier Iron & Railway Supply Co., of Washington, D. C., which was incorporated in Virginia last August, offers to apply the carrier iron to five cars of any railroad desiring to make tests of the apparatus. The company states that the carrier iron has been in practical service test on three railroads since January, 1889, and has accomplished its object of protecting the M. C. B. coupler from breakage through blows received in service, without any failure. The company make the following claims in a circular just issued: The cushion carrier iron is adapted to all kinds of car construction with a cushioning capacity of 250,000 lbs. per car end. It is provided with a self-lubricating bottom plate which alone will save enough in the wear of the M. C. B. type of couplers to pay for the first equipment, increasing the life of the couplers from the average service of four years to that of ten or more. The carrier iron will prevent the breaking off of guard arms or draw-heads. The office of the company is at 900 F. street, N. W., Washington, D. C. A. W. Van Dorston is President and General Manager.

Smokeless Engines.

The Chicago & Northwestern has just put into service in its Chicago yard a Schenectady six-wheel switching engine, 17 in. × 24 in., hard-coal burner, as an attempt to do away with the smoke nuisance. This engine weighs 91,300 lbs. on drivers, and runs between the passenger station and the docks on the lake front. The work done is very heavy. The line of travel is crossed by several long viaducts on some of the principal thoroughfares in the city, and the dense clouds of smoke from this company's engines have been a source of general complaint: so much so, that they have equipped much of the power with steam jets into the firebox just below the foot-plate. With long boxes there are several additional jets at the sides. These jets are worked from a small globe valve fastened to the boiler head, and are under the control of the fireman. The new engine No. 8 is made smokeless by the use of hard coal. The anthracite is put on the tank in large chunks and is thrown into the fire without a shovel. The coal requires little attention, hence it is greatly relished by the enginemen. The coal consumption has not as yet been determined exactly, though it is very small compared with that of other yard engines, but as the price per ton is much greater than that for bituminous coal, the cost of operating will be increased somewhat, which, however, would be easily offset by the reduction of the number of fines imposed by the city.

Baker Car Heaters for England.

The Baker Heater Co., of New York, has just shipped to London six of the latest improved Baker car heaters, to be fitted in cars built by the Gilbert Car Manufacturing Co. for the South Eastern Railroad of England.

THE SCRAP HEAP.

Notes.

The New York, Ontario & Western has discharged eight passenger conductors.

A Pullman sleeping car conductor has been arrested at Shreveport, La., for violating the law in permitting a colored passenger to ride in his car.

The proprietor of the station restaurants and eating-houses on the Atchison, Topeka & Santa Fe has secured from the courts a perpetual injunction restraining the road from running dining cars west of the Missouri River.

A dispatch from Gleiwitz, Prussian Silesia, says that a collision occurred between two passenger trains on the railroad connecting Golaczowy with Wolbrom, near the Russian frontier, on Sept. 22. Ten persons were killed and many injured.

The Association of Civil Engineers of the City of Mexico, at a recent meeting, by unanimous vote, resolved to visit Chicago in a body at the time of the World's Fair in 1893. The Minister of Public Works is the President of the Association.

The United States Superintendent of Immigration has been advised that the New York Central & Hudson River has directed the dismissal of all its alien laborers—that is, those who work on the road and reside in Canada. The employment of such laborers is in violation of law. The number of employés affected is small, being mostly clerks in the cities close to the frontier.

A report of the Board of Trustees of the Brotherhood of Locomotive Engineers, covering a period of 10 years, just published, shows that the membership increased during that period from 1,300 to 23,000. During the 10 years the total disbursements were $2,701,936, of which $446,400 was paid on account of the Burlington strike. The report shows that the vote of the 468 lodges throughout the country has resulted in a decision not to erect a headquarters building.

Railroads in Bulgaria.

During the year 1890 the Yamboli-Bourgas Railroad was completed and opened. The prospects of this line, however, are not very good, owing to the competition of other lines. So far the new line practically only serves to connect the two towns from which it obtains its name—Yamboli and Bourgas. The construction of the line, which occupied about twelve months, was carried out entirely by unskilled labor. The line is a little over 109 kilometres in length, and traverses a flat line of country which presents few engineering difficulties. The sleepers were from the extensive forests which fringe the southern and southwestern portions of this department, while the ballast was obtained from quarries at various points along the line. The rails are of English manufacture. There are a considerable number of small bridges on the line, all wooden structures, but the only one of important dimensions is that over the River Tounja at Yamboli. There are no tunnels on the line. The rolling stock consists of four large and two small engines. The passenger carriages all belong to the Tsaribrod-Sofia line, being only lent to the Yamboli-Bourgas Company at present. Of the goods wagons and trucks, some have been borrowed from the Oriental Railway Company, others from Belgium, while others again are a loan from the Varna-Roustchouk line. The Yamboli-Bourgas line has not at present many wagons of its own. The majority of the stations and other railway buildings are large, well built, and even handsome structures.—*Industries.*

Sugar and "Distress" in Germany.

In a recent number of *Kuhlow's* appears an article discussing the question whether or not there is considerable distress and poverty in Germany this year. This is a matter of considerable interest and importance to the United States, which has a good deal of wheat and corn to sell and which has recently had the German markets again thrown open for its hog products. As a test of the actual condition *Kuhlow's* takes up the figures of the consumption of sugar, which it terms a necessary luxury; that is, one can reduce his consumption of this staple without consequent suffering when it is necessary to curtail his expenditure for food. Therefore sugar probably furnishes a good test of the actual condition. Sugar pays an excise tax in Germany when it is drawn from bond for consumption. The figures reproduced below give the amounts withdrawn in the first six months of each year for the last three years. The quantities are in "double hundredweights" (100 kilograms). They are as follows:

1891.	1890.	1889.
2,250,239.	2,183,394.	1,865,367.

This shows a consumption per head of population of the German Empire of 3.8 kilograms for 1889, 4.4 for 1890 and 4.5 for 1891, which indicates a case of arrested development; but considering that if the people had not sufficient money to buy bread, potatoes and meat, they certainly would not buy sugar, the figures do not indicate general destitution. The price of sugar for the periods under consideration on the Magdeburg Exchange averaged nearly 7 cents per pound for 1889, a slight fraction over 6 in 1890, and 6½ in 1891. The high price for 1889 was due to "the Magdeburg corner," which raised the price of sugar all over the world. The paper concludes: "After studying actual facts such as these no one can credit the announcement that bitter want is prevailing throughout the country where at the same time the consumption of sugar increases month by month."

Americans Will Miss Their Familiar Block System.

Railroad travel in Switzerland appears to be dangerous. According to the official reports just issued concerning the recent disasters at Zollikofen and Moenchenstein, there is no "block system" on the roads, but only a time allowance between the trains, varying from 10 to 15 minutes, according to the grade. This is an admission calculated to render American tourists somewhat uncomfortable. . .—*New York Tribune.*

Cost of Shipbuilding in the United States and England.

An extensive inquiry has been made into the comparative cost of steel steamers of English and American build. In the comparsion the lake-built steamers Mackinaw and Keeweenaw are taken as the typical boats of American-built freighters. The opinions of leading shipbuilders on the coast show that steamships like the City of Paris can be constructed in America at not over 15 per cent. more cost than in British shipyards. For freighters the difference in cost is about 35 per cent. for the better class of boats. The showing is far more favorable to American shipyards than it was expected to be. The Mackinaw and Keeweenaw, taken as the basis of comparison, were built by F. W. Wheeler, of West Bay City, during the boom in lake shipbuilding, and cost between 10 and 15 per cent. more than if they were to be built now. They are set down at $275,000 each. At the present time the difference between the cost of British and lake-built steamers of that class is not over 20 per cent. With the lake shipyards idle as they now are, the difference might even be less. What started the inquiry was the statement in an English marine journal that it cost Americans 120 per cent. more to build steel boats than it did on the Clyde.

Railroads in Siam.

Toward the end of 1889 the Borapah Railway scheme for a metre gauge line from Bangkok to Ban-Mai on the Bang-pakong or Patriew River was again brought before the public. A prospectus was then pointing out, among other details, that the gauge of the proposed line was to be changed from one metre to 4 ft. 8½ in., and that the weight of the rails was to be 41½ lbs. per yard. The invitations to subscribers appear to have been but meagerly responded to. Between October, 1890, and May, 1891, notices were issued by the Director General of Railways, stating that tenders would be invited for the construction of the Royal Siamese State Railways from the capital, Bangkok, to Bang-pa-in, Ayuthia Saraburi, and Korat, a distance of 165 miles; that the whole work, inclusive of all materials necessary for completing the said railways, would be let out in one lot to a general contractor; that tenders should be sent in to the Director-General on or before Oct. 15, 1891, accompanied by an earnest deposit of £1,000; that the accepted contractor should deposit at the time of signing the deed of contract a sum equivalent to 5 per cent. of the value of the whole contract; and that the works should be commenced in December, 1891, and completely finished, ready for traffic, in 1896. The project of the Bangkok-Korat Railway has assumed a definite and consistent form since the promulgation, on March 1, 1891, of a Royal Ordinance, which shows clearly the King's wishes on this important subject. The cost of constructing the Bangkok-Korat Railway is estimated at between £6,000 and £8,000 per mile, and the government is stated to hold a reserve fund in cash sufficient to meet working expenses.

In connection with the railways in Northern Siam, or that portion north of Bangkok, reference may be made to the surveys, designs and estimates for railways undertaken for the Siamese Government by Sir A. Clarke and Messrs Punchard, McTaggart, Lowther & Co These have now been completed and submitted, with the exception of the one section from Chiengmai to Chiengsên, the field work on which will be finished by the end of the present dry season.

In March, 1891, an important concession for a railway across the Malay peninsula, from the port of Singora to Kota Star or Seiburee, the capital of Keda, and thence to Kulim, a stanniferous district of Southern Kedah, was granted to an Englishman in Singapore.

The concession is given on the most favorable terms, and the cost of the actual surface ground traversed by the proposed line, and of the land running parallel on each side of the same, is merely nominal. Seeing, then, that the King of Siam, the Rajah of Kedah, the Governor of Singora, and the Syndicates of Penang and Singapore are all equally interested, it may safely be anticipated that the Peninsular line will, before long, be an accomplished fact.

The first sod of the first railway in Siam was cut by the King of Siam, outside the city walls of Bangkok, about the middle of July last. The line, which is of the metre gauge, is intended to connect Bangkok with the mouth of the river, and will be about 15 miles in length. —*Industries.*

Turkish Railroad Notes.

From an article on the construction and operation of Turkish railroads given in recent issues of the Austrian *Eisenbahn-Zeitung*, it appears that the total length of the Turkish system now amounts to 478 kilometres or about 732 miles. Flange rails are used throughout, and about 380 miles is laid with steel rails, while the remaining portions have iron rails. With the exception of about 60 miles of road beginning at Constantinople, on which metal crossties are laid, oak ties are used almost exclusively. Other varieties of wood for crossties are used to a limited extent and are treated by the chloride of zinc process. Ties thus prepared have been in use for eleven years past and have given satisfactory results.

In the line of station buildings, the new passenger depot at Constantinople is given prominence. The station building proper is 328 ft. long and about 65 ft. wide. It is built in the Moorish style of architecture and has a marble and sandstone front. The motive power of the roads is made up of 21 passenger locomotives and 73 freight locomotives, or a total of 94 engines. There are, further, 6 parlor cars, 186 passenger cars, 31 baggage cars and 1,753 freight cars, making altogether 1,976. All passenger trains are fitted with Hardy brakes and are heated by steam. The maximum speed of passenger trains is about 32 miles per hour and that of freight trains about 20 miles per hour, while for mixed trains the limit is about 25 miles per hour. The whole equipment is said to be in a very fair condition, and traveling correspondingly agreeable. Since 1880 the system has been operated by an Austrian company; previous to that year it was in French hands. Offices of the company are at Paris, Vienna and Constantinople. In the traffic departments the French language is used; in all the other departments German is spoken. The principal officials are German, Austrian and Swiss, while station agents are Greeks and Armenians. Ordinary laborers are recruited from all the different nationalities represented in the country.

LOCOMOTIVE BUILDING.

The Northeastern Railroad of South Carolina has just received from the Baldwin Locomotive Works three locomotives with 18 × 24-in. cylinders. Two of the engines are for passenger service and the third is a switching engine.

CAR BUILDING.

The Wabash last week let to a Western car company a contract for the building of 300 new coal cars.

The Lake Erie & Western has awarded a contract to the Haskell & Barker Car Co. for 500 box cars, to be delivered by Jan. 1.

The Pittsburgh & Western has just completed a new baggage car in its shops at Allegheny which has several new features. It is 50 ft. long and cost about $3,000. Another similar baggage car is being built and also a new pay car which will be 35 ft. long and cost $3,500.

The Chicago & Eastern Illinois is about to let contracts for quite an addition to its rolling stock equipment, as recently reported. Twelve of the new passenger cars are to be for suburban service, and 12 for longer runs. Of the freight cars, 400 are to be gondolas of 60,000 lbs. capacity and 34 ft. long, and 200 box cars 36 ft. long, of the same capacity. These 600 freight cars will have rigid trucks and be fitted with vertical plane couplers of the "Chicago" pattern, the air brakes to be one-half Westinghouse and one-half of the New York Air Brake Co.'s make.

The new plant of the Madison Car Co. at Madison, Ill., will be in full operation next week, and will work upon the following contracts recently secured: 300 40-ft. 30 ton furniture cars for the Madison Belt R. R.; 25 barrel rack cars for the Standard Oil Co.; 1,000 34-ft. 30-ton box cars for the Chicago, Burlington & Quincy, and 500 34-ft. 30-ton box cars for the Savannah, Florida & Western. The shops of the company were fully described in these columns a few months ago. The officers are: L. M. Rumsey, President; C. D. McLure, Vice-President; Paul A. Fusz, Treasurer; J. G. Miller, Secretary, and T. C. Salveter, General Manager.

BRIDGE BUILDING.

Acworth, Ga.—Bids will be received by J. M. Stone until Oct. 3 for the re-erection of a bridge 130 ft. long near Acworth, and one 60 ft. long near Kennesaw.

Albany, N. Y.—The erection of a new iron bridge to the Columbia street pier will probably be commenced this week. The bridge will replace one that is considered unsafe.

Antrim, N. H.—An iron bridge is to be built across the Contoocook River, between this place and Bennington.

Belmont County, Ohio.—The county commissioners of Belmont County, Ohio, will soon be ready to receive bids for the erection of 11 new bridges over various streams in that county. They were empowered recently toissuebonds for $50,000 but the bonds were not sold till last week, when they were taken in Cleveland.

Bennings, D. C.—The commissioners of the District of Columbia have awarded to Engineer A. J. Neeld the contract for the erection of the new highway bridge over the eastern branch of the Potomac River. The bridge will be of iron on wooden piles, and will cost $50,530.

Boston, Mass.—The contract will be let next week for constructing an iron bridge over the tracks of the Boston & Albany at Berkely Street.

Bourne, Mass.—The County Commissioners of Plymouth and Barnstable counties have decided to locate the proposed bridge across the Cohasset Narrows from Buzzard's Bay village in Bourne to East Wareham at a point about 600 ft. east of the Old Colony Railroad bridge. The commissioners will apportion the amount to be paid by each county at a meeting on Oct. 5.

Cameron, W. Va.—The county commissioners of Marshall County, W. Va., have asked for plans for a new highway bridge over Fishers Creek near Cameron, W. Va. The plans asked for are for a steel bridge with a 40-ft. roadway, 90 ft. long.

Chehalis, Wash.—The contract for the iron span for the bridge across the Chehalis River for the South Bend extension of the Northern Pacific has been awarded to the San Francisco Bridge Co.

Danville, Va.—The Richmond & Danville will build an iron bridge over the railroad at the foot of South Main street in Danville, to connect the property of the West End Land Co. with the city.

Kenedy, Tex.—A new iron bridge is being erected by Karns County between Runge and Kenedy. Part of the iron work has already been delivered.

Linden, Md.—The new bridge of the Baltimore & Ohio Railroad across Rock Creek, near Linden Station, designed for the tracks which are to make the Southern connection, is nearing completion.

Meriden, Conn.—The Berlin Iron Bridge Co. has been awarded a contract for the iron-work on the new highway bridge at South Meriden for $6,515.

Milledgeville, Ga.—D. B. Stanford will receive bids until Oct. 5 for building a bridge 120 × 16 ft. long across Fishing Creek on the Midway road.

Ogden, Utah.—Bids will probably soon be asked for building a new bridge over the Weber River at the foot of Fourth street in Ogden. The City Council last spring appropriated $9,000, the county to pay the balance, but delay has been caused by the County Court refusing to be responsible for any of the substructure work.

Ossining, N. Y.—The towns of Ossining and Mount Pleasant have agreed jointly to build an iron bridge over the Pocantico River.

Pittsburgh, Pa.—Contracts lately received by the Pittsburgh Bridge Co. include one for a seven-span bridge about 400 ft. long at Minneapolis, Minn., which is to be built by the Great Northern Railroad Co. The contract will require about 450,000 lbs. of material. Another is for a bridge with a 250-ft. span at Evansville, Ind. A contract of historical interest is that for a 130-ft. highway bridge across Antietam Creek, on the battlefield of Antietam.

Point Pleasant, W. Va.—The County Court of Mason County, W. Va., has asked for plans and specifications for six highway bridges to be erected over Crooked Creek at various points along the Huntington, road in that county. The bridges are to be of steel and have a 20-ft. roadway. They vary in length from 50 to 180 ft.

Radford, Va.—The new steel bridge which crosses the New River at Radford, Va., has been opened. It was built by the American Bridge & Iron Works, of Roanoke, Va., and is 1,460 ft. long, 40 ft. wide and has 27 spans. It is said to be the longest highway bridge in the South.

Seabright, N. J.—The drawbridge at Seabright, N. J., which spans the South Shrewsbury River, and is owned by a company of city capitalists, has been purchased by the Board of Freeholders of Monmouth County for $20,000.

West Virginia Central & Pittsburgh.—The burning of the factory of the Youngstown Bridge Co., at Youngstown, O., on Sept. 4, delayed the delivery of several bridges that the company was building for the West Virginia Central & Pittsburgh Railroad. The Lanaconning bridge, a structure of two spans, truss and girder, each span 82 ft. in length, was completed in the shop and ready for shipment when the fire took place, and had to be rebuilt. The Westernport bridge was a single span of 90 ft., and was also almost done. The Wills Creek bridge, almost the same as the Lanaconning bridge in length and structure, would have been on the ground by this time had it not been for the fire. Mr. J. T. Williams, of the company, said last week that the bridges would all be ready for erection by Oct. 1, in spite of the fire. The factory has been rebuilt and is at work.

Wheeling, W. Va.—The foundations for the 158-ft., single span stone arch bridge building across Wheeling Creek, in Wheeling, W. Va., by Paige, Carey & Co., were completed last Friday after nearly a year's work, and the first of the "skew-backs" were put in on Sunday. The arch will be commenced as soon as the false work can be put in. The work of driving piles for the false arch was commenced last Monday. The city has had some trouble paying the contractors' estimates on the work on account of inability to sell the bonds. The bonds were issued at 4½ per cent. interest, and aside from $30,000 that were sold among local bankers, none were taken. The City Council has ordered a reissue for the remainder at six per cent. Last month Paige, Carey & Co. took the city's acknowledgment of indebtedness in lieu of cash for the estimate.

Winona, Minn.—The City Council has awarded to the Chicago Bridge & Iron Co. the contract for erecting a new highway and wagon bridge across the Minnesota River at Winona. The bridge is to be of the cantilever type and to be 2,753 ft. long. The cost will be $94,700, and the work is to be completed by July 1, 1892.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

The Supreme Court of the United States decides that where a company is incorporated to construct a railroad between two cities named as termini, a mortgage given by it which expressly covers its line of railroad constructed or to be constructed between the named termini, together with all the stations, depot grounds, engine houses, machine shops, buildings and erections now or hereafter appertaining unto said described line of railroad, creates a lien on its terminal facilities in those cities, and is not limited to so much of the road as is found between the city limits of those places.[1]

In Iowa a statute provides that if the directors of any railroad of 3 ft. gauge receiving taxes voted in aid thereof under the act shall vote to mortgage or incumber the road for more than $16,000 per mile, they, or those voting in the affirmative, shall be liable to each stockholder in an amount double the par value of his stock, if the stock is rendered less valuable thereby. The Supreme Court holds that persons receiving shares for taxes voted and paid after the recording of a mortgage for more than $16,000 per mile cannot recover against the directors who voted the same.[2]

In Texas the Supreme Court rules that where the Receiver of a railroad has been discharged, and the property returned to the company, it is liable on causes of action which accrued against the Receiver in the operation of the road, to the extent at least of the net earnings applied by the Receiver in making permanent improvements, and such actions may be enforced in other courts than the one by which the receiver was appointed. And in an action for an injury to a servant resulting from the defective condition of the track while the road was operated by a Receiver, it is no defense that the defect existed when the Receiver took possession, and he had not sufficient time in which to repair the track.[3]

In the Supreme Court of the United States it is held that a claim for supplies furnished for operating a railroad before the appointment of a Receiver may be ordered paid out of the fund arising from the sale of the road, in preference to the mortgage bondholders.[4]

In Alabama the Supreme Court rules that under the statute which prohibits railroad companies from making any departure from their published freight rates except to aid in the development of industrial enterprises in the state, an agreement to allow a rebate on coal shipped to a miller, and used by him in manufacturing corn into meal, is valid.[5]

In Texas the Supreme Court holds that under the Act of Congress providing that no interstate railroad shall confine cattle in cars for a longer period than 28 hours, without unloading the same for rest, water and feeding, unless prevented from so doing by storm or other accidental cause, was not intended to fix a period during which the company could, without incurring liability, hold cattle without unloading for such purposes.[6]

The Supreme Court of California rules that one who has only a right to pasture his stock on another's land, adjacent to a railroad, is entitled to the protection of the statute requiring railroad companies to maintain a fence.[7]

In New York the Court of Appeals holds that under the statute making it the absolute duty of a railroad company to fence its track, except where such fence is unnecessary to prevent stock from going on the track from the adjoining land, it is no defense to an action for killing stock, where the road was not fenced, that the stock strayed upon the track across the unfenced track of another railroad company, and that the two tracks were so close together that a fence could not be erected between them without endangering human life.[8]

In Illinois the Supreme Court rules that where a city has granted to a railroad company the right to grade and use certain streets in such manner as may suit the company's convenience, provided that the streets shall be so graded that vehicles may conveniently cross them, the company cannot be enjoined, at the suit of the city, from so obstructing the streets as to prevent their free use by the public as public streets, but only from so grading them as to prevent vehicles from crossing.[9]

Injuries to Passengers, Employes and Strangers.

In Oregon the Supreme Court holds that trunks containing stage properties, costumes, paraphernalia, advertising matter, etc., carried with a theatrical company on its journey are not "baggage," as they are not articles required for the pleasure, convenience or necessity of the members of the troupe during their journey; and therefore no liability can arise against the carrier for their loss or destruction, unless accepted as baggage by the carrier.[10]

In Alabama the Supreme Court decides that a railroad is liable for personal injuries sustained by a passenger by reason of a defect in a platform erected near the tracks, on the company's station grounds, which it permits its passengers to use in going from the train to and from the hotel for meals, though the platform may have been erected by the owner of the hotel, who also agreed with the company to keep it in repair. And the passenger is not precluded from recovering for the injury by the fact that he left the train, and went to the hotel to keep a private business appointment.[11]

In New York a shipper of cattle entered into a contract with defendant railroad company whereby, in consideration of reduced rates of transportation, and a free pass to accompany the cattle, he released defendant from all damages to such cattle, except such as might arise from the fraud or willful misconduct of the company. Plaintiff was employed by the shipper to go with the cattle, and was designated in the contract and in the waybill as in charge free. The Supreme Court rules that the contract with the shipper did not affect defendant's liability to plaintiff for injuries received while traveling in charge of such cattle.[12]

In Oregon a switch has been tampered with so that it would not return the rails to their proper position after it had been turned for a side track. A brakeman turned the switch, and after his train had entered on the side track he turned the switch for the main line. A rule of the company made conductors personally responsible for the proper adjustment of switches used by their trains, but neither the conductor nor the brakeman looked to see that the rails obeyed the motion of the switch. In a short time another train passed on the main line, and was wrecked at the switch, injuring the engineer and fireman. The Supreme Court holds that the failure of the brakeman and conductor of the first train to see that the switch was properly adjusted was the negligence of fellow-servants, and the company was not liable.[13]

In New York a railroad provided proper cars and the stakes necessary to secure freight on flat cars, but established no rules for the loading of lumber, except a general one, requiring employés "to attend to the loading of all freight, . . . to see that it is safely stored, and so that it cannot fall off the cars." While one of the company's cars, loaded with lumber without the use of stakes, was going a short distance, several sticks fell off and killed plaintiff's intestate, who was free from contributory negligence. It is held by the Court of Appeals that the failure to establish a rule requiring lumber loaded on flat cars to be secured in all cases rendered the negligence of those loading the cars imputable to the company, even though they were fellow-servants of deceased.[14]

The code of Alabama makes an employer liable to an employé for personal injuries resulting from the negligence of any person in the employer's service, who has charge or control of any engine, car, or train upon a railroad. The Supreme Court holds that a provision in a contract between a railroad company and a switchman, whereby the regular wages paid the latter was to cover all risks and liability to accident from every cause, and the right of damages, was not to be recognized, was against public policy, and void.[15]

In the same state it is held that a railroad, in using on a regular freight train an engine without a cow-catcher, is liable for injuries to an employé resulting from its derailment in striking an animal.[17]

In Texas in an action against a railroad for negligently frightening plaintiff himself and his horse, it appeared that, as plaintiff approached a highway crossing, defendant's engine came down the track, and stopped near the crossing, and that plaintiff's team, though badly frightened, crossed safely in front of the engine, and that they could have turned round and gone back without crossing. Plaintiff testified that neither his horse nor himself was injured except by fright, that he did not know how much his horse was worth, or how much he was damaged, or how much he was himself damaged. The Supreme Court rules that there was no evidence to support a judgment for plaintiff.[18]

In the same state it is laid down that where a deaf man goes upon a railroad track, and stands there unobservant of an approaching train, and is killed, he is guilty of contributory negligence, and there can be no recovery, notwithstanding the negligence of the engineer in failing to keep a lookout for persons on the track.[19]

The Court of Appeals of Kentucky rules that where a person crossing a railroad track at an unfrequented place, and unseen by those in charge of the train, is injured by the backing of the train, the company will not be liable, though no signal was given.[20]

[1] Central Trust Co. v. Kneeland, 11 S. C. Rep., 357.
[2] Walker v. Birchard, 48 N. W. Rep, 71.
[3] T. & P. R. Co. Seger, 15 S. W. Rep., 214.
[4] Kneeland v. Bass F. & M. Works, 11 S. Ct. Rep., 857.
[5] Louisville & N. R. Co. v. Fulgham (Ala.), 8 South Rep., 803.
[6] Missouri Pac. Ry. Co. v. Ivy, 15 S. W. Rep., 692.
[7] McCoy v. S. P. R. Co., 26 Pac. Rep., 629.
[8] Kelver v. New York, C. & St. L. R. Co., 27 N. E. Rep., 553.
[9] Chicago, B. & Q. R. Co. v. City of Quincy, 27 N. E. Rep, 232.
[10] Oakes v. Northern Pac. R. Co., 26 Pac. Rep. 230.
[11] Watson v. V. & G. R. Co., 8 South Rep., 770.
[12] Porter v. N. Y. L. E. & W. R. Co., 13 N. Y. S., 491.
[13] Miller v. Southern Pac. R. Co, 26 Pac. Rep., 70.
[14] Ford v. L. S. & M. S. Ry. Co., 26 N. E. Rep., 1101.
[15] Hissong v. R. D. R. Co., 8 South Rep., 776.
[17] Tennessee C., I. & R. Co. v. Kyle, 8 South Rep., 791.
[18] Ft. Worth & D. C. Ry. Co. v. Burton, 15 S. W. Rep., 197.
[19] H. & S. A. Ry. Co. v. Ryon, 15 S. W. Rep., 588.
[20] Woodyard v. Kentucky C. Ry. Co., 15 S. W. Rep., 178.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Oregon Railway & Navigation Co., quarterly, 1¼ per cent., payable Oct. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Baltimore & Ohio Southwestern, annual, Cincinnati, O., Oct. 14.

Chicago, Detroit & Canada Grand Trunk Junction, annual, Detroit, Mich., Sept. 30.
Denver & Rio Grande, annual, Denver, Col., Oct. 20.
Fitchburg, annual, Boston, Mass., Sept. 30.
Lake Erie & Western, annual, Bloomington, Ill., Oct. 7.
Louisville & Nashville, annual, Louisville, Ky., Oct. 7.
Michigan Air Line, annual, Detroit, Mich., Sept. 30.
Montreal & Ottawa, special, Montreal, P. Que., Oct. 9.
New Jersey & New York Extension Railroad Company, special, 120 Broadway, New York City, Sept. 30, to vote upon a proposed increase of capital stock.
New York, Ontario & Western, annual, 18 Exchange Place, New York City, Sept. 30.
New York, Pennsylvania & Ohio, annual, 30 Euclid avenue, Cleveland, O., Oct. 14.
Northern Pacific, annual, Mills Building, New York City, Oct. 15.
Old Colony, annual, Boston, Mass., Sept. 29.
Peoria, Decatur & Evansville, annual, Peoria, Ill., Oct. 6.
St. Paul & Duluth, annual, St. Paul, Minn., Oct. 8.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

Oct. 14

The *American Society of Railroad Superintendents* will hold its annual meeting in New York City, Oct. 12.

The *American Railway Association* (*Time Convention*) will hold its fall meeting in New York City, Oct. 14.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* will hold its next meeting at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in September.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union Station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street New York

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m, on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* hold regular meetings on the third Tuesday in each month, as 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursdays at 8 p. m The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* hold regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers' of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

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The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 p. m. on the first Friday of each month.

Various Associatiens.

A number of traveling auditors met in Chattanooga, Tenn., last week and organized the Associated Traveling Auditors of the United States. The following officers were elected: S. V. Corwine (C., N. O. & T. P.), Cincinnati, President; F. E. Brevard (E. T., V. & G.), Knoxville, Secretary: A. H. Plant (M. & C.), Memphis, Treasurer. Circulars were sent out to all traveling auditors in the United States. The next meeting will be held at St. Augustine, Fla., in January.

The American Association of Railway Clerks met at St. Louis Sept. 18. They adopted resolutions opposing strikes or any affiliation with any Order countenancing them. The following officers were elected for the ensuing year: President, George P. Round, Boston; Secretary, Frank L. Solomon, Boston; Treasurer, W. C. Pearce, Boston. The association will meet in Philadelphia next year.

The sixth annual convention of the Switchmen's Mutual Aid Association of North America was held in Philadelphia on Monday of this week.

The annual convention of the Brotherhood of Locomotive Engineers is now in session in Montreal. Over 400 delegates are present.

The Brotherhood of Railroad Conductors held its annual meeting in Louisville, Ky., Sept. 21.

The Brotherhood of [railroad] Telegraph Operators and the Order of Railway Telegraphers amalgamated at the session of the Grand Lodge of the former organization in St. Louis Sept. 15. The officers of the railroad operators will exercise the power, and the laws of the association will be recognized as applicable to the new union until the annual convention, which will be held at Chattanooga in June next. It was also resolved that the operators' organization make application to be admitted to the Federated Council of Railway Employés.

PERSONAL.

—Mr. F. C. Lewis, formerly Chief Engineer of the Youngstown Bridge Co., has accepted the position of Chief Engineer to the Columbus Bridge Co., Columbus, O.

—Mr. Charles H. Tutton, formerly Engineer in charge of the Lehigh Valley improvements on the Tifft Farm, near Buffalo, has opened an office at No. 24 West Seneca street, Buffalo.

—The unveiling of a monument to the late Gen. William C. Wickham, Vice-President of the Chesapeake & Ohio Railroad, the funds for which were contributed by the employés of that company, will take place at Richmond Oct. 29.

—Mr. J. F. O'Rourke, recently engineer for the contractors of the Chignecto Ship Railway, and before that Chief Engineer of the Poughkeepsie Bridge, has been appointed engineer to the Rapid Transit Commissioners of New York, in charge of surveys.

—M. Armand Stevart, formerly Chief Engineer of the Belgium State Railroads, and now in charge of the railroad department of the Belgium School of Mines, has been visiting this country and making an investigation of the railroad systems. Last week he was in Chicago, and visited the prominent works there.

—Col. Samuel B. Pickens, General Freight and Passenger Agent of the South Carolina road, died in Charleston, S. C., Sept. 17, aged 52 years. Colonel Pickens has been connected with the South Carolina road since 1869 and has been General Freight Agent for the last 12 years. Colonel Pickens served with credit in the Confederate Army during the Civil War and was a colonel at 25. He was a lineal descendant of General Andrew Pickens of Revolutionary fame.

—Mr. A. M. Mozier, who has been Superintendent of Transportation of the New York, Pennsylvania & Ohio and the Chicago & Erie, has been appointed Superintendent, succeeding Mr. F. C. Merrill, who retires to engage in business in Missouri. Mr. Merrill has been Superintendent of the Chicago & Erie since November, 1890, and had previously been connected for many years with different railroads, having risen from the office of telegraph operator to be General Superintendent of the St. Louis & San Francisco.

—Mr. William C. Stroud, of the firm of Burnham, Williams & Company, proprietors of the Baldwin Locomotive Works, died at his country home at Rosemont, Pa., Sept. 2, in the fifty third year of his age. Mr. Stroud had been ill about a year, and only occasionally during that time was able to attend to any business. He was born in Philadelphia, and has been connected with the Baldwin Locomotive Works since 1869. In that year he became chief bookkeeper of the works, his responsibilities increasing until he assumed charge of the financial management. He became a partner in 1885.

—Mr. William McCreery died at Allegheny, Pa., Sept. 16, in his 63d year. Mr. McCreery has been a prominent citizen of Pittsburgh since 1856, when he became a partner in a commission house. In 1864 he purchased the Mahoning Iron Works, which he managed for seven years, during this time building the Lawrence Railroad and the Pittsburgh & Ashtabula line. He was also interested in the construction of the Pittsburgh & Lake Erie and of the Pittsburgh, Cleveland & Toledo. He was a large stockholder in many coal, iron and mining companies and several street railroads. He was very active during the war in equipping steamboats on the Ohio River for the Army of the Cumberland. He organized a branch of the National Sanitary Commission, and after the close of the war was Manager of one of the Pittsburgh hospitals. In 1889 he was President of the Johnstown Relief Committee formed in Pittsburgh.

—Mr. William L. Scott died at Newport, R. I., Sept. 19, after a long illness. Mr. Scott was a man of national reputation, chiefly, perhaps, through his political activity. He was three times Mayor of Erie, Penn., and twice elected to Congress. Mr. Scott's history is a record of wonderful successes. He was thrown on his own resources when a boy, through the death of his father, and he has now left a fortune estimated at over $20,000,000. His first business interest was in shipping on Lake Erie. He soon branched out into mining and manufacturing, and later became interested in the construction of railroads. His mining operations assumed great proportions, and it is said that the extent of the coal mines controlled by him was only exceeded by those of the Philadelphia & Reading Coal and Iron Co., and he is said to have employed 10,000 men. He said himself in a biographical notice that he was director in railroad companies owning over 22,000 miles of road. Besides many Pennsylvania companies, he was director of the Chicago & Northwestern and the Chicago, Rock Island & Pacific.

ELECTIONS AND APPOINTMENTS.

Albany & Susquehanna.—At the annual election of the company, held in Albany, N. Y., Sept. 10, the following were elected directors: Minard Harder, Cobleskill, N. Y.; James Roosevelt, Hyde Park; Henry M. Olmsted, Morristown; George I. Wilber, Oneonta; Alfred Van Santvoord, Benjamin H. Bristow, Robert Olyphant, William H. Tillinghast and Robert M. Olyphant, New York; Robert C. Pruyn, James H. Manning, Horace J. Young and W. L. M. Phelps, Albany.

Baltimore & Ohio.—J. M. Graham, lately Assistant General Superintendent of the Northern Pacific, has been appointed Superintendent of the Ohio and Midland divisions of this road with headquarters at Newark, O. He succeeds R. W. Baxter, who returns to the Northern Pacific as Superintendent of the Wyoming Division.

Columbus Southern.—The following directors were elected at the annual meeting at Columbus, Ga., Sept. 15: T. J. Pearce, S. A. Carter, T. E. Blanchard, B. H. Hood, John Stephens, T. M. Woolfolk, W. B. Lowe, George W. Parrott and J. W. English. The following officers were elected: President, W. B. Lowe; Vice-President, J. W. English, and Secretary and Treasurer, George W. Parrott.

Decatur, Chesapeake & New Orleans.—A new Board of Directors has been chosen, comprising William Nelson Cromwell, William B. Wheeler, T. D. Warren, W. W. Ladd, John J. Toffey, Henry Belden, H. B. Berry, W. S. Burckett and M. S. Decker. The officers are: President, William Nelson Cromwell, New York; Vice-President, W. W. Ladd; Treasurer, Henry Belden, and Secretary, H. B. Berry.

Fayetteville & Albemarle.—The annual meeting of the stockholders resulted in the re-election of the old Board of Directors and the following officers: John Blue, President; N. W. Ray, Vice-President; A. A. McKeithan, Treasurer, and Z. W. Whitehead, Secretary.

Grand Rapids & Indiana.—S. G. Scott having resigned the position of Road Master of the Southern Division, and Cincinnati, Richmond & Fort Wayne road, F. S. Bowen has been appointed Road Master of Southern Division of the Grand Rapids & Indiana, with headquarters at Kalamazoo, Mich. James Leavy has been appointed Road Master of Cincinnati, Richmond & Fort Wayne, with headquarters at Portland, Ind.

Mexican Interoceanic.—R. Taylor has been appointed General Manager of this road, which will be open for traffic its entire length Oct. 1.

New York & New England.—E. M. Humstone, who has been for several years Division Master Mechanic at Hartford, Conn., has been appointed Superintendent of Motive Power to succeed Albert Griggs, resigned. His headquarters will be at Norwood, Mass.

Norfolk & Western.—J. B. Fuller has been appointed Division Engineer Maintenance of Way, with headquarters at Roanoke, Va., vice G. M. Tompson, resigned. M. J. Caples has been appointed Assistant Engineer, Radford Division, with headquarters at Radford, Va., vice J. B. Fuller, promoted.

Pierce City & Northern.—The directors are: A. L. White, J. W. Vance, C. A. Raupp, G. N. Bennett, L. L. Allen, Jay Forsythe, M. W. Clay, Jos. Newman and I. P. Linzee.

Rio Grande & Gunnison.—The incorporators of this Colorado company are: Joel F. Vaile, Henry F. May, Charles W. Waterman, Harlan Parmelee and C. A. Chisholm.

St. Johnsbury & Lake Champlain.—The annual meeting of the railroad was held at St. Johnsbury, Vt., Sept. 10. The old Board of Directors were elected as follows: C. E. Bartlett, Chelmsford, Mass.; George C. Lord, Newton, Mass.; Samuel C. Lawrence, Medford, Mass.; William T. Hart, Boston; C. S. Page, Hyde Park, Vt.; George W. Hendee, Morristown, Vt.; Franklin Fairbanks, St. Johnsbury, Vt.; H. E. Folsom, Lyndonville, Vt.; S. C. Shurtleff, Montpelier, Vt.

Texas & New Orleans.—John Bagnal has been appointed Auditor of this road and of the Gulf, Harrisburg & San Antonio with headquarters at Houston, Tex., to comply with the state law, requiring general offices to be in the state. Mr. Bagnal has been General Traveling Agent of the Atlantic system of the Southern Pacific, and succeeds E. M. Underhill, General Auditor, whose headquarters are at New Orleans.

Texas & Pacific.—M. W. Elliott, Acting Superintendent of Motive Power and Rolling Stock, having resigned, Mr. A. S. Douglass has been appointed Superintendent of Motive Power and Rolling Stock.

Western New York & Pennsylvania.—John F. Reynolds has been appointed Acting Auditor to succeed William L. Doyle, who resigned last week. Mr. Doyle resigned this office last June, but withdrew his resignation a few days later.

RAILROAD CONSTRUCTION.
Incorporations, Surveys, etc.

Baltimore & Ohio.—A branch of the Somerset & Cambria division, about three miles long, has just been completed to large stone quarries near Milford, in Somerset County, Pa.

Brookline & Pepperill.—It is reported that the contract for building the first section of this line from Brookline, N. H., to the Massachusetts state line has been let and that construction will be commenced at once. The terminus of the line in Massachusetts is to be at West Groton on the Fitchburg road, about 14 miles south of Brookline.

Canadian Pacific.—The Souris branch is now in operation as far as Melita, Man., and has been located from that point about 98 miles westward to the coal fields in Range 6. About 60 miles of this has been graded, and the contractors have just started track laying, 4½ miles having been laid up to Sept. 19. For the most part the work is ordinary prairie grading, but there is some heavy work at the crossing of the Moose Mountain Creek, near Alameda, where there is a trestle 1,300 ft. long and 80 ft. high.

Clarksville Mineral.—McTighe & Co. have completed the grading and tracklaying on the northern extension of this line, and will remove their forces this week. Some of the sub-contractors will not have the small bridges and culverts between Budd's Creek and the Dickson County line quite completed until October. The road is in operation for a number of miles on the southern end to Cumberland Furnace. The line is about 31 miles long, and extends from the Louisville & Nashville at a point west of Clarksville south to Pond Station west of Dickson.

Cleveland, Wooster & Muskingum Valley.—The contractors completed the tracklaying on this branch of the Akron & Chicago Junction road last week. The last spike was driven by J. H Hauke, who commenced the grading on the line about nine years ago when the road was begun by a local company. The surfacing is about finished, and the line will probably soon be transferred to the Baltimore & Ohio by Ryan & McDonald, and placed in operation between Lodi and Wooster, 20 miles.

Columbus Southern.—At a recent meeting of the stockholders the directors were authorized to extend the road south into Florida, either from Lawson or Albany, Ga. The directors were authorized to issue bonds to cover the cost of the extension on the same terms as the bonds for the old part of the road.

Corsicana & Southeastern.—The citizens of Corsicana Tex., have subscribed about $21,000 toward a fund of $30,000 which is asked by a syndicate to complete a road from Corsicana through Navarro County and southeast about 50 miles to Palestine. The survey has been made and part of the right of way secured. M. A. Williams and A. Wickers, of New York City, state that the grading will be commenced as soon as the $30,000 have been subscribed.

Denver, Apex & Western.—W. G. Smith, the Secretary and Treasurer of the company, has just returned to Denver from an eastern trip, and states that he has secured the interest of bankers in the proposed line, who agree to place bonds to build the road to Georgetown as soon as the company completes out of its own resources the first 20 miles west of Denver, which amounts to about half the distance to Idaho Springs.

Eagle's Mere.—A charter was granted in Pennsylvania last week to this company, with a capital stock of $36,000. The line will be six miles long, from a point on the Williamsport & North Branch road near Sonestown, Sullivan County, to the village of Eagle's Mere. Andrew J. Maloney, of Philadelphia, is President.

East Coast Transportation Co.—George M. Robbins has just completed a survey for a road proposed by this company, which is to extend from Daytona south along the east coast of Florida to Titusville on the Indian River. The line is about 40 miles long. The company is preparing statistics of the probable business which have been asked for by Eastern bankers, and it is confident they will advance the money it asks to complete the road.

Elgin, Joliet & Eastern.—A short branch of this line has just been completed through Aurora, Ill., to a new station on Garfield avenue. It is probable that a branch will also soon be built from a point near Joliet north about five miles to coal fields at Lockhart, Ill., on the Chicago & Alton, a distance of about five miles.

Elk River.—J. A. Swann, of Charleston, West Va., one of the incorporators of this company, states that about $375,000 has been subscribed to the capital stock, and that the company proposes to begin the grading in October. The road has been surveyed along the Elk River from Charleston to Sutton, in Braxton County, a distance of about 175 miles.

Florida, Georgia & Carolina.—This company was organized at Milledgeville, Ga., Sept. 18, to build the proposed line between Abbeville, S. C., and Tampa, Fla., which has received considerable attention in the local newspapers. The route in Georgia will probably be through the towns of Washington, Milledgeville, Jordan, Eastman and Du Pont. W. A. Gaines, of Mt. Carmel, S. C., is President, and P. J. Cline, of Milledgeville, is Vice-President.

Georgia Roads.—Bills have passed the state legislature incorporating the following companies: Savannah & Oconee; the Georgia Mineral; the Washington & Middleton; the Brunswick, La Grange & Northwestern; the Transrate; the Georgia, Virginia & Baltimore; the Atlanta, Americus & Florida, and the Atlanta, Southern & Western; the Southern Air Line; amending the charters of the Abbeville & Waycross; the Nacoochie Valley; the Middle Georgia & Atlantic; the Cartersville & Gainesville Air Line; the Fairmount Valley; the Alabama & Atlanta; the Louisville Branch, and the Alabama & Bainbridge.

Grafton & Greenbrier.—It is now positively asserted that this line from Grafton, where it connects with the Baltimore & Ohio to Belington, W. Va., where it is to connect with the extension of the West Virginia Central & Pittsburgh, will be ready for the standard gauge cars as soon as the Belington branch of the West Virginia Central is completed. The ties for the standard gauge road are alongside the track almost all the way, and for a part of the way the rails have been distributed. The ties will all be put in and the transfer made the full length of the line in a day or two.

Great Northern.—The track on the Pacific extension is expected to be laid to the town of Kalispell, Mont., in the Flathead Valley, late in the fall. It is at present laid to the summit of the main range of the Rocky Mountains, where it is temporarily delayed by some heavy unfinished rock work. In two months the grading will be finished and ready for the track as far west as Bonner's Ferry, Mont., on the Kootenai River and north of Lake Pend d'Oreille. The Pacific extension, beyond Marias Pass, in the Rocky Mountains, extends westerly down the Flathead River into the Flathead Valley, from whence it takes the most direct and practicable course for the Kootenai River, crossing two summits on the way, one with a tunnel 1,425 ft. in length. After leaving the Kootenai River the line will cross over to the main waters of the Columbia River, and from thence across the Cascade Mountains in Washington, and to the Puget Sound.

Great Salt Lake and Hot Springs.—The work on the road is progressing rapidly. There are 13 contractors and 75 men at work on the section between Beck's hot springs and Centerville, north of Great Salt Lake City, a distance of eight miles. About two miles are graded, ready for the rails. Engineers are locating and cross-sectioning from Centerville to Farmington, and as soon as this work is completed the contract for the grading will be let. A preliminary survey is also being made from Farmington to Lake Park with the purpose of extending the road to that point.

Hearne & Brazos Valley.—Bracey Bros. & Co., of St. Louis, who have been grading on the Kansas City, Watkins & Gulf road, are reported to have a large contract for extending this line along the Brazos Valley, west of Hearne, Tex. The contractors are removing their working outfit from Louisiana, and expected to begin the grading in Texas in a few weeks. At present about 10 miles of the line is under construction from Hearne to the Brazos River, the grading being principally done by the farmers in the valley.

Long Beach & Alamitos Bay.—New articles of incorporation for this company were filed in California last week, the capital stock being placed at $100,000. The new company is a reorganization of the old company of the same name and a consolidation with the Long Beach & Ocean, both of which were incorporated over a year ago to build a road over the same route from Los Angeles to the Pacific Ocean.

Meherrin Valley.—The operation of this road, which was purchased about a year ago by the Seaboard & Roanoke and the Petersburg road, has been recently discontinued. The road is about 18 miles long, and extends from Hicksford, near Emporia, Va., on the latter road southeast to Margarettesville, N. C., near the Virginia state line.

Mount Nebo.—W. J. Thompson, of Little Rock, Ark., proposes to organize a company to build a road about five miles long from Dardanelle, Ark., and an incline road up the mountain. The road will be chartered as soon as the method of construction and the motive power is decided. The line will probably be operated by the White & Black River Valley road, of which Mr. Thompson is General Manager. An officer writes as follows of the project: Mount Nebo is 1,200 or 1,300 ft. above the valley at its base and is about 5½ miles from Dardanelle. We wish to build a light railroad from Dardanelle to the foot of the mountain, and then build an incline up the mountain which will be about 3,000 ft. long and the elevation will be from 20 to 45 degrees. We are now considering the most feasible plan of operating the two lines. We have been advised that we can use a locomotive in drawing cars over the 5½ miles of nearly level road and then use the locomotive at the base of the mountain in hoisting and lowering cars on the incline, by running it on friction rollers attached to a drum. If we cannot adopt that plan we wish to secure machinery for operating the incline separately, preferring the power at the base of the mountain. As soon as we procure satisfactory information to enable us to determine upon plan of construction and approximate cost we will organize the company and commence construction.

New Roads.—The railroad that is being built by the Siena Lumber Company in Contra Costa County, Cal., has been completed from Anderson for about three miles. The grading is in progress east of the Sacramento River, and it is expected that 16 miles of the road will be completed before Nov. 1. The bridge across the Sacramento River will probably not be finished until some time after. The right of way has been obtained as far north as Big Valley.

A survey has just been completed by H. M. Ramseur for a road four miles long from Sylva south to Webster, in Jackson Co., N. C. The road is to develop the mining interest of the Carolina Mining, Manufacturing and Improvement Company. William C. Miller is Vice-President and General Manager.

New York, Susquehanna & Western.—The company has nearly finished its second track between West End and Paterson. The main work is cutting through Red Hill, at Hackensack, and replacing the wooden bridge and trestle where the road crosses the Erie's tracks with iron bridges and a viaduct. A trestle 1,200 ft. long at the crossing has been filled in. Following this are new abutments and piers with a three-span iron bridge, the spans being 117, 140 and 293 ft. From the bridge east is an 800-ft. iron viaduct. Iron bridges are also being placed across First and Second streets in Hackensack.

Pennsylvania.—Nearly all the grading and tracklaying is completed on the Trenton cut-off except to make the connection with the main line at Frazer and Glen Loch, beyond Norristown. This short section is now nearing completion, several hundred men being employed, and the entire line will probably be in operation next month. This line is 46 miles long from Trenton to Glen Loch, 13 miles shorter than the distance between these points by the main line through West Philadelphia. The old road is a part of the line constructed by the state, and has many curves. On the cut-off both grades and curves are slight, and the roadway has been substantially constructed. Of the 4,000 cars which on an average now pass Glen Loch daily, it is expected that about 2,000 will be sent over the cut-off.

A number of surveys have been made for short branches through the suburbs on the north of Philadelphia to connect with the new Trenton Cut-off. Besides the Roxborough road from Germantown to Plymouth, a survey is being made from Solerton, on the southern line of Bucks County, crossing the New York division of the Philadelphia & Reading, and thence to a connection with the Trenton Cut-off, which will be about five miles long. Another line has been surveyed from the Chestnut Hill branch to near Fort Washington.

Pennsylvania Co.—Extensive improvements on the Pittsburgh, Fort Wayne & Chicago between Allegheny and Alliance, 83 miles, which include the construction of third and fourth tracks near Allegheny, are nearing completion. The third track will extend from near Glenfield into Allegheny, and when completed will practically complete a triple track from Allegheny to Wampum. Between the stations of New Galilee and Highland there is a cut, 2,500 ft. long, the hill having an altitude of 100 ft. in one place. There is a reverse curve and the side of the hill is being cut away for 2,000 ft. so that this can be changed to a simple curve, and a second track laid through the cut and for a mile beyond it. About 60,000 cu. ft. of earth will be removed, as the tracks will also be lowered 4 ft. The cost of the improvement at the Darlington hill will probably be about $100,000. The improvements being made at Allegheny will cost about $50,000. A number of lap sidings are being built at points along the line.

Pierce City & Northern.—This company was organized at Pierce City, Mo., last week when directors were elected. The company proposes to build a road about 16 miles long from Pierce City, on the St. Louis & San Francisco through Lawrence County in southwestern Missouri, to Mount Vernon. It is stated that it is likely that the road will be consolidated with the Greenfield & Northern.

Pittsburgh Junction.—Three miles of double track, which has just been completed between McLaughlin and Thirty-third street, Pittsburgh, was opened for traffic last week, and a fourth mile, nearly completed, will be put in use very soon. The road is operated by the Baltimore & Ohio, and is seven miles long. The line is now practically double track for its entire length, as three miles have had a second track several years.

Portland & Rumford Falls.—Bids were received last week from 15 contractors for building the extension through Dixfield and Peru to Rumford Falls, Me., 17 miles. The directors expect to let the contract at Portland next week.

Richmond & Danville.—A short branch of the North Carolina road has been built from Raleigh to the Caraleigh Mills, south of the city, near the Neuse River. The further extension of the line is delayed by litigation over the right of way.

Rio Grande & Gunnison.—This company was organized in Colorado last week to build a road from near Gunnison to Wagon Wheel Gap, connecting with the main line of the Denver & Rio Grande at the former point and with the Wagon Wheel Gap branch at the latter town. The incorporators are interested in the Creede mine north of Wagon Wheel Gap. The charter describes the route as follows: to commence at Wagon Wheel Gap, in Rio Grande County, extending in a northerly direction to the Creede camp and up the Rio Grande River, and through Willow Creek Valley to the divide separating the waters of the Rio Grande and Gunnison rivers; thence in a northeasterly direction through Saguachee County, down Cochetopa Creek, to a junction with the Denver & Rio Grande near Parlin, in Gunnison County. A branch line is to be built from Willow Creek, across the divide, to the headwaters of the Cebolla or White Earth Creek, and thence down said creek by the most feasible route to a junction with the Denver & Rio Grande, near Cebolla, in the Gunnison country, west for Gunnison.

Roxborough.—The Railroad Committee of the Philadelphia City Council has approved the location of the road to the connection with the Trenton Cut-off at Plymouth, Montgomery County. The route surveyed is 10 miles long, and begins at Chelton avenue station on the Germantown & Chestnut Hill branch of the Pennsylvania, extending in a northeasterly direction to Roxborough, Pa. The largest bridge will be over the Wissahickon Creek, and will be of iron, 135 ft. high and 564 ft. long. There will be no highway crossings at grade, seven overhead bridges being planned to avoid them, and two crossings below grade. W. F. Dixon, of Philadelphia, is President.

St. John's Shore & Panama Park Belt Line.—This company has filed articles of incorporation in Florida, with a capital stock of $100,000. The company will build a road from near the western extremity of Bay street, in the city of Jacksonville, northward to Panama Park, thence along the shore of St. John's River to the point of beginning, forming a complete circuit, about 10 miles in length. The directors are T. V. Cashen, George W. Gill, J. F. Nichols and H. Maynard.

St. Louis, Kennett & Southern.—The survey for the extension south of Kennett was commenced last week near that point in Dunklin County, and will be run to Corneliusville, Pemiscot County. President Houck states that the company will receive a land grant of 40,000 acres of swamp and timber land and that the construction of the line will begin as soon as the survey has been completed.

San Antonio & Aransas Pass.—The tracklaying on the Waco Division has been resumed north of Cameron, Tex., the contractors having obtained an order from the district court in which the receivership is invested, an order dissolving the injunction of the lower court which was obtained by Gurley, Ross & Gurley. The latter firm graded most of the extension a year ago between Waco and Cameron, but claim they have never received payment for the 20 miles between Lott and Cameron. J. P. Nelson and McFlynn & Kenedy, who have the contract for completing the division, are now repairing the old grade to Lott and will then lay the track and complete the extension.

The preliminary survey for the proposed branch to deep water at Brazoria, Tex., which was begun about a month ago, has been completed for a distance of about 60 miles from Giddings and Evergreen southeast to the Colorado River. The survey is now being run beyond Eagle Lake to Wharton and will then be continued southeast to Columbia and Velasco, on the the Brazoria River.

South Bound.—The trains of this company are now running to Graham's, S. C., the road having been completed to that point in July, and arrangements have just been completed with the Richmond & Danville for trackage right over its Charlotte, Columbia & Augusta division to the Union station Columbia, S. C. The connection for the Columbia line is to be made about two miles from the junction of the Charlotte, Columbia & Augusta with the South Carolina road.

Southern Pacific.—A local paper states that the Medina Valley branch west of San Antonio, Tex., will probably be completed by this company. The road was partly graded over a year ago from La Custe to Castroville, Tex., about seven miles.

Susquehanna & Buffalo.—A charter was granted at the State Department, at Harrisburg, Pa., on Sept. 22, to this company for a line 15 miles long, from Cook's Run, Clinton County, on the Philadelphia & Reading road to Trout Run, same county. The capital stock is $180,000. John R. T. Ryan, of Williamsport, Pa., is President.

Wheeling & Lake Erie.—The company has engineers surveying a new branch line, beginning at the line of the Steubenville extension at Rush Run, Jefferson County, O., and extending to Smithfield, in the same county, eight miles away. The line is to open up large coal lands owned by the company near Smithfield.

Williams Valley.—This company, whose road, as described last week, will extend from Brookville to Tower City, Schuylkill County, Penn., a distance of three miles, was granted a charter last week. The capital is $30,000 and the President is Carroll Williams, of Philadelphia.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—The company will move into the Grand Central station in Chicago within a few weeks, or as soon as the connections with the Northern Pacific tracks can be made. Work is being pushed as rapidly as possible. The city ordinance notifying the road to vacate the present station on the lake front at once has been modified and the time in which the tracks may be moved has been extended indefinitely.

Central Pacific.—The Secretary of the Treasury has announced that he will receive for account of the sinking fund of this road and first mortgage six per cent. Pacific Railroad bonds that are a prior lien to that of the Government to the amount of $75,000 maturing in 1896, $346,000 in 1897, $1,684,000 in 1898, and $406,000 in 1899, and deliver in exchange therefor United States currency sixes of similar dates of maturity upon the basis of an increased income to said sinking fund of 1¼ per cent.

Chesapeake & Ohio.—C. P. Huntington has disposed of the balance of his holdings of the common stock of this company, consisting of about 25,000 shares. It is said that the sale was made to a London syndicate through Drexel, Morgan & Co. at about 27. The stock sells for 26¾ on the market. Mr. Huntington retains about 100,000 shares of the road's first and second preferred stock. The bulk of his holdings of the common stock he sold to the Vanderbilt and Drexel, Morgan & Co. interest about a year ago.

Chicago, St. Paul & Kansas City.—The annual report for the year ending June 30, just issued, gives the gross earnings for 1891 as $4,360,851, and for 1890, as $4,225,675, an increase of $135,176. The operating expenses in 1891 were $3,325,340. The aggregate tonnage was $1,388,368. Including all terminals, the cost of the road is placed at $42,898,882; improvements, $2,017,002; leased equipment, $1,524,539; total, $46,440,420.

Cincinnati & Westwood.—A mortgage for $100,000 on the six miles of road between Cincinnati and Robb's Station, in favor of D. B. Gamble as trustee, was filed at Cincinnati last week. The mortgage is to secure $100,000 of six per cent. bonds due in 25 years, which are a lien on all the property of the company.

Denver & Rio Grande.—The stories current of a lease of this road to the Atchison, Topeka & Santa Fé are denied in New York. Chairman Magoun, of the Atchison, says that the Rio Grande is not to be leased, as Colorado law forbade it. The arrangement is for the purpose of effecting economies on both roads. A similar system to that proposed has been in operation on the Atchison and Missouri Pacific systems.

Eel River.—This road has been thrown into the hands of a receiver. It is leased by the Wabash, and forms a link in the Peru and Detroit division, extending from Logansport to Butler, Ind., 94 miles. Dennis Uhl, of Logansport, has been appointed Receiver. The Receiver was appointed on complaint of D. D. Dykeman, one of the stockholders. The action is said to be a complete surprise to officers of the Wabash Railroad. The road was formerly called the Detroit, Eel River & Illinois.

Marietta & North Georgia.—Special master in chancery, B. H. Hill, filed his report in the action of the Central Trust Co. against the railroad. He recommends that the road be sold, as it is not earning operating expenses, or that $165,285 be spent on changing the grade near the Tennessee-North Carolina state line, that 35 miles of 40-lb. rails be relaid with 60-lb. rails. He also recommends the sale of the line from Blue Ridge to Murphy, or its abandonment, as it has never earned operating expenses. He recommends that $122,127 be expended on a bridge and terminals at Knoxville, and that a bridge be built over the Cartecay River at Ellijay; that the road be ballasted from Knoxville to Hiwassee; that shops be erected at Marietta, and that the interest on the first mortgage bonds be paid.

Mexican Central.—President Reynolds says that the company has now practically earned $1,140,000 of subsidy on its Tampico Division, which is payable to the company in Mexican Government six per cent. bonds, and when the work is done it will receive $3,000,000 all told. These bonds are now just about ready for the printer, and when fully executed will be turned over to the company and will go into its treasury as an asset.

New Jersey & New York Extension.—A meeting of the stockholders of the company has been called for Sept. 30, at 120 Broadway, New York City, for the purpose of voting upon a proposal to increase the capital stock of the company from $60,000 to $75,000.

New York, New Haven & Hartford.—The annual report of the road shows the following: Gross income, $11,511,981; gross expenses, $7,929,901; net income, $5,383,079; net earnings applicable to dividends, $1,902,006; dividends paid, $1,895,000; surplus for the 12 months, $37,096. The receipts from passengers were $6,649,986, and from freight $4,673,630. During the year there has been expended for permanent improvement in four-tracking the New York division, double-tracking the Shore Line division, right of way, etc., $3,073,982.

Nova Scotia Central.—A decree of foreclosure has been entered against this company at Halifax, N. S., in the suit brought by the Farmers' Loan & Trust Co. last April. The Trust company is trustee of about $1,000,000 of the bonds issued to complete the road between Middleton and Lunenburg, 74 miles. The road has been opened about a year, but has been operated since May by W. B. Wade and J. E. Wade as Receivers.

Philadelphia & Reading.—The following official statement was made this week: The Reading syndicate was formally dissolved on Wednesday last by the vote of more than two-thirds of its members. The syndicate was originally formed with the idea of controlling the property absolutely. It held, however, at the time of dissolution on Wednesday only 225,000 shares, while nearly 400,000 shares were necessary to control. The syndicate was composed of about 12 members, and all of these except one have joined in the agreement of dissolution. The one member who has not yet signed represents only a small amount of the stock.

Western & Atlantic.—Since the Nashville, Chattanooga & St. Louis road leased this line from the State of Georgia a large sum has been expended on maintenance of way and improvements of shops and other buildings. The following summary is printed in an Atlanta paper as a fair record of what has been accomplished this year near Atlanta. The lessees have just completed an iron bridge over the Chicamauga, and have contracts outstanding for the completion, before Jan. 1, 1892, of 14 iron bridges, in all 41 spans of 3,304 lin. ft. These bridges are built under Louisville & Nashville standard specifications; they have relaid fifteen miles of track with 68-lb. steel rails and are distributing ten miles additional. They have put in 80,000 crossties, have relaid and repaired ten miles of side track in Atlanta, and have put in three-quarters of a mile of additional side track. A new freight shed and transfer platform has been built in Atlanta. All the old Dooley switches have been taken out and 124 standard split switches have been put in. A new 54-ft turn-table has been put in the Atlanta round-house. The road has been equipped with first class new cabooses, and new freight engines are being put in service.

Union Pacific.—The report of the July earnings of the entire system shows an increase in operating expenses of $115,034 and a loss in net earnings of $484,081. The figures are as follows:

UNION PACIFIC SYSTEM.

Month of July:	1891.	1890.	Inc. or dec.	
Mileage	8,144	8,028	D.	116
Gross earnings	$3,580,289	$3,949,335	D.	$369,047
Oper. expenses	2,445,802	2,330,768	I.	115,034
Net earnings	$1,134,487	$1,618,567	D.	$484,081
Since Jan. 1:				
Mileage	8,144	8,033	I.	111
Gross earnings	$23,017,652	$24,665,270	D.	$1,647,618
Oper. expenses	16 099,744	16,995,268	D.	895,523
Net earnings	$6,917,908	$7,670,002	D.	$752,094

Reports for several divisions of the system follow:

UNION PACIFIC PROPER.

Month of July:				
Mileage	7,668	7,548		120
Gross earnings	$3,500,823	$3,837,362	I.	$336,539
Oper. expenses	2,373,114	2,224,590	I.	148,524
Net earnings	$1,127,709	$1,612,772	D.	$485,063
Since Jan. 1:				
Gross earnings	$22,416,628	$23,739,111	D.	$1,322,483
Oper. expenses	15,522,146	16,227,763	D.	705,617
Net earnings	$6,894,482	$7,511,348	D.	$616,866

OREGON SHORT LINE & UTAH NORTHERN.

Month of July:				
Mileage	1,422	1,399	I.	23
Gross earnings	$654,013	$699 268	D.	$45,255
Oper. expenses	394,046	390,337	I.	3,709
Net earnings	$259,967	$308,931	D.	$48,964
Since Jan. 1:				
Gross earnings	$4,356,193	$4 222,828	I.	$133,3656
Oper. expenses	2,692,118	2,783,914	D.	91,79
Net earnings	$1,764,075	$1,438,914	I.	$225,161

UNION PACIFIC, DENVER & GULF.

Month of July:				
Mileage	1,452	1,386	I.	66
Gross earnings	$531,388	$527.661	I.	$3,727
Oper. expenses	409.372	338,027	I.	71,345
Net earnings	$122,016	$189,634	D.	$67,618
Since Jan. 1:				
Gross earnings	$3,005,955	$3,166,308	D.	$160,353
Oper. expenses	2,420.879	2,207,302	I.	$213,577
Net earnings	$585,076	$959,006	D.	$373,930

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Sept. 23, 1891.

It now looks as though the Western roads would make "home visitors' excursion" rates quite generally, in spite of their decision not to do so. The Iowa Central, in connection with the Toledo, Peoria & Western, has decided to make these rates from points in southern Iowa, and the Keokuk & Western and Des Moines & Northern will also make the rates. The Burlington has announced that it will be compelled to meet the competition with these lines, and the Chicago, St. Paul & Kansas City also proposes making the rates from Des Moines.

The National Despatch and the Soo line's reduced westbound freight tariffs recently established have shut the Chicago-St. Paul lines out of the through business. The National Despatch rail and lake tariff of Sept. 19 reduces the Boston-St. Paul rate to 56 cents (first-class), which is 10 cents below the first-class basis Chicago to St. Paul, while the Soo line tariff going into effect to-day reduces it to 51 cents. The latter is a reduction from 1.04 first-class and is made on an all-rail basis. The comparison of the old and new tariffs via the Soo line shows the following reductions:

	1	2	3	4	5	6
Old rate	1.04	88	71	48	39	33
New rate	51	45	35	25	25	25

Chairman Finley has decided that the St. Louis, Keokuk & Northwestern violated the agreement of the Western Passenger Association in selling certain tickets at one-third of the regular fare to a party of Dunkards returning to Abilene, Kan., in May last, and has ordered that the St. Louis, Keokuk & Northwestern pay over to the association such amount as should have been charged at full tariff rates for the tickets and for such other tickets as may have been sold upon the same basis.

The Commissioners of the Western Traffic Association have rendered a decision in the matter of a proposed removal of shipments of leather from California to Texas from the jurisdiction of the Western Traffic Association. The Southern Pacific and the Atchison, Topeka & Santa Fe wished to change rates so as to create an opportunity for California and Oregon tanneries to compete in Texas with tanneries on the Missouri and Mississippi rivers. Opposition arose, and it was suggested that the two lines proposing the change could accomplish their purpose by filing an agreement to remove the traffic in question from the jurisdiction of the Western Traffic Association. Notice was accordingly given under Article IX. of the By-Laws of the Western Traffic Association, and opportunity given other lines claiming an interest in the traffic to make application to the commissioners. Objections were filed by the Missouri Pacific and the Union Pacific, but the objection of the Union Pacific was afterward withdrawn. The principal objection of the Missouri Pacific referred to the effect of the proposed tariff upon its traffic in leather to Texas from tanneries on the Missouri and Mississippi rivers, and in other Eastern territory. The commissioners say they cannot believe that it was the intention of the by-laws to authorize the establishment of competitive tariffs without a fair consideration of the rights of competing interests, and continue: This is not traffic the competition for which is limited to the roads presenting the proposition, but it is traffic for which they are in direct competition with other lines from the East, and the partial exclusion of the latter from the traffic is the object sought to be effected. The case is one in which a fair consideration of the proper adjustment of the rate by the various association lines is peculiarly proper, and where a reasonable adjustment as between the various competing interests is intended to be secured by the agreement. If the various lines do not agree among themselves, an arbitration is provided for under the by-laws. The commissioners conclude, therefore, that the Missouri Pacific is an interested party; that the lines were not authorized to withdraw the traffic from the association, and that the rates should be restored.

The Commissioners have approved the application of the Northern Pacific to put in upon plates, beams, angle bars, Z-bars, T-deck beams and steel rods, to be used in the construction of merchant marine vessels at Tacoma, Wash., a rate of 80 cents per 100 lbs. from Pittsburgh to Tacoma, graded in accordance with the usual grade on iron east and west of that point, provided the Northern Pacific will agree to cancel the same if found to be applied to other material, or if likely to involve similar reduced rates to other Pacific coast terminals. The decision says: "If it is at any time found that the continuance of the rate will seriously endanger the rates on other iron or steel, then the special rate shall be immediately canceled."

Traffic Notes.

On Saturday night and Sunday last the Philadelphia & Reading ran 54 trains from the Schuylkill coal regions to Philadelphia, delivering 9,615 cars in Philadelphia. The estimated average load was 6¼ tons per car.

The Texas Railroad Commissioners have issued commodity tariff No. 5, applying on wood and coal. The rate on coal and coke in car loads for five miles is 45 cents per ton; for 50 miles, 90 cents; 100 miles, $1.15, and for 400 miles, $3.90.

Freight rates from New England to the northwest via Lake Superior continue to go down, the latest reduction being the tariff of the Northern Steamship Co. based on 42 cents first class, Boston to St. Paul, eight cents lower than the tariff of the National Dispatch via Sarnia.

The Interstate Commerce Commission's special agent has secured the indictment at Kansas City of M. Knight, Freight Traffic Manager of the Wabash; S. B. Knight, Freight Agent of the Wabash, and H. B. McClellan, Freight Agent of the Lehigh & Wabash Freight Line, for alleged paying of rebates.

The Southern Pacific having ignored the tariff recently promulgated by the Oregon Railroad Commissioners reducing rates on imported commodities, the Comissioners have entered suit against the road in the Marion County Circuit Court. It will be remembered that the Union Pacific did not wait for the Commissioners to take action but itself entered suit in the court.

The Secretary of the National Association of Car Service Managers has issued a statement showing the operations of the various associations for the quarter ending July 31. The number of cars handled was 2,064,312, being 286,830 more than the number handled in the preceding quarter; and the average detention was 1.61 days, as compared with 1.63 days for the quarter ending April 30.

The Mercants' Bridge & Terminal Railway Co. (St. Louis), has reduced its tariff to the following: Merchandise, 2 cents per 100 lbs.; coal, coke, pig-iron and similar freight, 1 cent per 100 lbs.; sugar, salt, agricultural implements, etc., 1½ cents per 100 lbs. The rates are said to be from 20 to 33 per cent. below the prices charged by the other bridge company.

The Boston & Montana Copper & Silver Mining Co. has ordered about 6,000 tons of material and machinery in Pittsburgh and vicinity for a new smelter, to be erected at Great Falls, Mont., and the freight agents are actively bidding for the carriage of the traffic. It includes 1,000,000 firebrick, from Harbison & Walker; 750 tons of structural iron, from Carnegie, Phipps & Co.; 700 tons of castings, from the Pennsylvania Steel Co., of Steelton, and W. B. Pollock & Co., of Youngstown, and about 600 tons of machinery, the contract for which has not been awarded. In addition, Stillwell, Bierce & Co., of Dayton, O., will furnish a large number of turbine wheels. Great Falls is a local point on the Great Northern, and the freight will go over that line for 1,200 miles.

Trans-Continental Traffic.

The June statement of traffic carried by trans-continental lines shows the revenue from freight traffic to have been $1,924,345, an increase of $523,425 over June, 1890. Revenue from passenger traffic was $697,988, a decrease of $15,872 from June, 1890. The percentages carried by the principal lines were as follows:

Line.	Passenger.	Freight
Atchison	16.49	18.22
Southern Pacific	26.36	37.20
Union Pacific	14.94	22.91
Northern Pacific	19.50	11.87

Eastbound Shipments.

The shipments of eastbound freight, exclusive of live stock, from Chicago by all the lines for the week ending Sept. 19 amounted to 57,894 tons, against 60,191 tons during the preceding week, a decrease of 2,297 tons, and against 70,658 tons during the corresponding week of 1890, a decrease of 12,764 tons. The proportions carried by each road were:

	Wk. to Sept. 19.		Wk. to Sept. 12.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	9,247	16	10,151	16.9
Wabash	4,161	7.2	3,782	6.3
Lake Shore & Michigan South.	8,847	15.3	8,314	13.8
Pitts., Ft. Wayne & Chicago	5,858	10.1	6,321	10.5
Pitts., Cin., Chicago & St. L	7,639	13.2	7,895	13.1
Baltimore & Ohio	3,229	5.6	3,795	6.3
Chicago & Grand Trunk	4,666	8·1	4,623	7.7
New York, Chic. & St. Louis	6,755	11.7	7,131	11.8
Chicago & Erie	7,492	12.9	8,179	13.6
Total	57,894	100.0	60,191	100.0

Of the above shipments, 6,758 tons were flour, 22,707 tons grain, 2,113 tons millstuff, 4,455 tons cured meats, 8,977 tons dressed beef, 1,179 tons butter, 975 tons hides and 5,978 tons lumber. The three Vanderbilt lines carried 43 per cent., the two Pennsylvania lines 23.3 per cent. The lake lines carried 115,174 tons, against 133,649 tons during the preceding week, a decrease of 18,475 tons.